

COMM 226 – FINAL EXAM REVIEW

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Chapter 1: The Importance of MIS

Notes from Multiple Choice Questions

"The number of transistors per square inch on an integrated chip **doubles** every **18 months**." This observation is known as **Moore's Law**.

As a result of Moore's Law, the price to **performance ratio of computers** has fallen dramatically.

Because of Moore's Law, the cost of **data communications and data storage** is essentially zero.

The cost of **data storage** is so low that it is essentially free.

Because the cost of data storage and data communications is essentially zero, **any routine skill will be outsourced to the lowest bidder**.

In today's world, skills such as tax accounting and computer programming no longer guarantee job security. What is the reason for this?

They are routine skills, which can and will be outsourced to the lowest bidder.

Peter is an engineer working in the United States. In accordance with Moore's Law, which of the following is a nonroutine cognitive skill that would provide him with job security? **Systems thinking**.

Modeling system components and showing how components' inputs and outputs relate to one another is attributable to **systems thinking**.

Creating and testing promising **new alternatives**, consistent with available resources is an example of **experimentation**.

Abstract reasoning is the ability to make and manipulate models.

Systems thinking is the ability to model the components of a unit, to connect the inputs and outputs among those components into a sensible whole that reflects the structure and dynamics

of the phenomenon observed.

Collaboration is the activity of two or more people working together to achieve a common goal, result, or work product.

In a job interview, you are asked to make a group presentation with four other interviewees. You are required to form a team and then compete with other groups to win the presentation contest. Which of the following skills is your interviewer trying to test? **Collaboration**

Patricia is the marketing manager at a manufacturing firm. She develops ideas and plans with her subordinates and provides and receives critical feedback. Here, Patricia is displaying **collaboration** skills.

Which of the following is necessary for effective collaboration?

The ability to give and receive critical feedback

Which of the following marketable skills is the most useful in overcoming the fear of failure?

Ability to experiment

Experimentation involves making a reasoned analysis of an opportunity, envisioning potential solutions, evaluating those possibilities, and developing the most promising ones, consistent with the resources one has.

In a job interview, you are asked to use a product that you have **never** used before and are not familiar with. Which of the following skills is your interviewer trying to test?

Ability to experiment

A group of components that interact to achieve a purpose is referred to as a system.

When you use a computer to write a class report, you are using the computer, storage disk, keyboard, and monitor as tools. You use MS Word or some other word processing program, and type words, sentences, and paragraphs in your report. You also enter your report into the program, print it, and save and back up your file. In this situation, identify the procedure component of an information system.

Entering the report, printing it, and saving it

Which of the following is an example of the **hardware component** of an information system?

Microprocessor

The **five-component framework of an information system** consists of **computer hardware, software, data, people, and procedures.**

In a grocery store, the clerk scans the UPC code on an item, which is transmitted to the computer. The actual scanner device is an example of the **hardware** component of an IS.

What are **key elements** of the definition of **management information systems (MIS)**?

Information systems, development and use, and business goals and objectives

Which of the following is a valid reason for a company to create a new information system?

The new information system will increase employee productivity.

Information technology: the products, methods, inventions, and standards that are used to produce information.

Which of the following distinguishes information systems from information technology? People

Users should take security seriously is the most crucial requirement for the success of a security system?

An essential characteristic of a strong password: It should not contain your user name or company name.

You have created a password, which meets all the criteria for a strong password. What is a potential drawback of such a password? **It will be difficult to remember.**

Which of the following, if true, would **weaken** a password?

It contains a complete dictionary word in Latin.

Which of the following techniques is best suited for creating memorable, strong passwords?

Base passwords on the first letter of the words in a phrase.

In order to protect your password, you should never write down your password.

Which of the following statements on password etiquette is true?

If someone asks for your password, do not just give it out.

If someone asks for your password, go over to that person's machine and enter your password yourself.

Essay Questions

1) Define Moore's Law and explain how the phenomenon it describes affects the technology business.

Moore's Law states that the number of transistors per square inch on an integrated chip doubles every eighteen months. The more common version of this is expressed as "The speed of a computer chip doubles every eighteen months" which is incorrect. Due to the impact of Moore's Law, the price/performance ratio of computers has fallen dramatically over the past decade, and computers have shrunk dramatically in both size and cost while computing power has increased drastically. Moore's Law is the principal reason why data storage and data transmission are essentially free today. New businesses like YouTube and Facebook have taken advantage of the opportunities offered by this development.

2) What is a marketable skill?

It used to be that one could name particular skills, such as computer programming, tax accounting, or marketing as examples of marketable skills. But today, because of Moore's Law, because the cost of data storage and data communications is essentially zero, any routine skill can and will be outsourced to the lowest bidder.

One has to develop strong non-routine cognitive skills to be more successful and such skills are called marketable skills. Abstract reasoning, systems thinking, collaboration, and ability to experiment are marketable skills.

3) What is abstract reasoning? Provide an example.

Abstract reasoning is the ability to make and manipulate models. Constructing a model of the five components of an information system is an example of abstract reasoning.

4) What is meant by systems thinking?

Systems thinking is the ability to model the components of a system, to connect the inputs and outputs among those components into a sensible whole that reflects the structure and dynamics of the phenomenon observed.

5) What is collaboration? How can one ensure effective collaboration?

Collaboration is the activity of two or more people working together to achieve a common goal, result, or work product. Effective collaboration isn't about being nice. In fact, surveys indicate the single most important skill for effective collaboration is to give and receive critical feedback.

6) What is experimentation? Explain its importance.

Successful experimentation is not throwing buckets of money at every idea that enters your head. Instead, experimentation is making a reasoned analysis of an opportunity, envisioning potential solutions, evaluating those possibilities, and developing the most promising ones, consistent with the resources you have. Fear of failure paralyzes many good people and many good ideas. This can be overcome by having the ability to experiment.

7) Describe an information system.

A system is a group of components that interact to achieve some purpose. An information system (IS) is a group of components that interact to produce information. An IS is based on the five-component framework of computer hardware, software, data, procedures, and people. These five components are present in every information system—from the most simple to the most complex.

8) Describe the five components of an information system using an example.

The five components of an information system are computer hardware, software, data, procedures, and people. When you use a computer to write a class report, you are using hardware (the computer, storage disk, keyboard, and monitor), software (Word, WordPerfect, or some other word-processing program), data (the words, sentences, and paragraphs in your report), procedures (the methods you use to start the program, enter your report, print it, and save and back up your file), and people (you).

9) Do you think a computer is an essential component of an information system? Why or

why not?

Many information systems include computers. However, there are information systems that do not include computers. A **calendar** hanging on the wall outside of a conference room that is used to schedule the room's use is also an information system.

10) Define **management information systems. What are the key elements of its definition?**

Management information systems refer to **the development and use of information systems that help businesses achieve their goals and objectives**. This definition has three key elements: development and use, information systems, and business goals and objectives.

11) Other than development tasks, what are the other roles than you will need to undertake in the use of information systems?

In addition to development tasks, you will also have important roles to play in the use of information systems. You will need to learn how to employ the system to accomplish your goals. You will also have important ancillary functions as well. For example, when using an information system, you will have responsibilities for protecting the security of the system and its data. You may also have tasks for backing up data. When the system fails, you will have tasks to perform while the system is down as well as tasks to accomplish to help recover the system correctly and quickly.

12) What are the points one needs to keep in mind when deciding to implement a management information system (MIS)?

When deciding to implement an MIS, one needs to keep in mind that information systems are not created for the sheer joy of exploring technology. They are not created so that the company can be “modern” or so that the company can claim to be a “new-economy company.” They are not created because the IS department thinks it needs to be created or because the company is “falling behind the technology curve.” **An MIS exists to help businesses achieve their goals and objectives**. As a future business professional, you need to learn to look at information systems and technologies only through the lens of business need.

13) Explain the difference and the relationship between information technology (IT) and information systems (IS).

Information technology and information system are two closely related terms, but they are different. IT refers to methods, inventions, standards, and products. IT refers to raw technology, and it concerns only the hardware, software, and data components of an information system. In contrast, an information system is a system of hardware, software, data, procedures, and people that produce information. IT, by itself, will not help an organization achieve its goals and objectives. It is only when IT is embedded into an IS—only when the technology within the hardware, software, and data is combined with the people and procedure components—that IT becomes useful.

14) What is the role of users in information security?

Like all information systems, security systems have the five components, including people. Thus, every security system ultimately depends on the behavior of its users. If the users do not take security seriously, if they do not follow security procedures, then the hardware, software, and data components of the security system are wasted expense.

15) Explain how you would create a strong password.

Strong passwords should have seven or more characters in them, consisting of upper and lower case letters, numbers, and special characters. They should not contain any complete dictionary word in any language, nor should they contain your user name, real name, or company name. They should also be different from any other password that you have previously used. An example of a strong password is Qw37^T1bb?at.

16) Explain the necessary password etiquette to be followed by users of an information system.

Once you have created a strong password, you need to protect it with proper behavior. Proper password etiquette is one of the marks of a business professional. Never write down your password, and do not share it with others. Never ask others for their passwords, and never give your password to someone else.

Chapter 2: Business Processes, Information, and Information Systems

Notes from Multiple Choice Questions

A **business process** is a network of activities, roles, resources, repositories, and data flows that interact to accomplish a business function.

Activities are collections of related tasks that receive inputs and process those inputs to produce outputs.

In a business process flowchart, activities are shown in **rectangles**.

Roles are sets of procedures.

Decisions are shown in **diamonds** in a business process flowchart.

A **decision** is a question that can be answered yes or no

Decisions provide branching points within the flow of a business process.

Roles are shown in **ovals** in a business process flowchart.

Resources are people, facilities, or computer programs that are assigned to roles.

Roles are shown above or below activities in a business process flowchart?

A **repository** is a collection of business records.

Repositories hold the collective memory of an organization?

Repositories are shown as scrolls in a business process flowchart.

What is the defining characteristic of the outermost components (hardware and people) of the IS framework?

They take actions

The software and procedure components of the IS framework are both **sets of instructions**.

The **software** component of the IS framework provides instructions for hardware.

The **procedure** component of the IS framework provides instructions for people.

In the IS framework, **data** is the bridge between the computer side on the left and the human side on the right.

Which of the following are *actors* in an information system?

Hardware and people

When work that was formerly done by people has been moved to computers, it is said to be **automated**.

Automation of a process activity consists of moving work from the **human side** to the **computer side** of the symmetrical five-component framework.

Information is defined as **knowledge derived from data**.

John Reed examines the stature of each of his team members on the school basketball team. He finds that the average height of the players is 6 feet 3 inches. John's finding is an example of **information**.

Data is defined as recorded facts or figures.

The fact that Jeff Parks works 9 hours per day is an example of **data**.

Which of the following is a characteristic of good information?

It must be contextually relevant

As the CEO of a call center, which of the following information is good information for you?

Department-level averages of revenue generation figures

Relevant information is information that directly pertains to both the context and to the subject it

references.

Which of the following refers to information that is based on correct and complete data, and has been processed correctly as expected?

Accurate information

A monthly report that arrives 6 weeks late is an example of information that is not **timely**.

Which of the following is true regarding characteristics of good information?

Information must hold an appropriate relationship between its cost and its value.

A **problem** is the perceived difference between what is and what ought to be.

Egocentric thinking centers on the self.

People who engage in **empathetic** thinking consider their view as one possible interpretation of the situation and actively work to learn what other people are thinking.

Essay Questions

1) What is a business process? Define activities.

A business process is a network of activities, resources, facilities, and information that interact to achieve some business function. Activities are collections of related tasks that receive inputs and process those inputs to produce outputs. Activities can be manual (people following procedures), automated (hardware directed by software), or a combination of manual and automated.

2) List the components of a business process.

The components of a business process include:

1. Activities
2. Decisions
3. Roles
4. Resources
5. Repository
6. Data flow

3) Briefly describe a repository.

A repository is a collection of business records. A repository can be a cardboard box, a notebook, a list, an Excel spreadsheet, a database, or even a collection of databases. Repositories hold the collective memory of the organization. One of the major considerations in the design of information systems is determining how many repositories should exist, or, equivalently, how much data should be stored in particular repositories.

4) What are resources in a business process?

Resources are people, facilities, or computer programs that are assigned to roles. One way to improve the performance of a business process is to add resources to roles. One way to reduce costs is to reduce the number of people fulfilling a role. Another way to reduce costs is to replace human resources with computer-based resources.

5) Describe the process of automation against the background of the five-component framework of an information system.

The five components of an information system are hardware, software, data, procedures, and people. They are arranged symmetrically in the framework. The outermost components, hardware and people, are both actors; they can take actions. The software and procedure components are both sets of instructions: Software is instructions for hardware, and procedures are instructions for people. Finally, data is the bridge between the computer side on the left and the human side on the right. When an activity in a business process is handled by an automated system, it means that work formerly done by people following procedures has been moved so that computers now do that work by following instructions in software. Thus, the automation of a process activity consists of moving work from the right-hand side of the five-component IS framework to the left.

6) Define information.

The most common definition of information is that information is knowledge derived from data, where data is defined as recorded facts or figures.

7) Explain data with an example.

Data is defined as recorded facts or figures. The fact that an employee of an organization earns \$17.50 per hour and that another employee of the same organization earns \$25.00 per hour is an example of data.

8) Define accurate information. Why is an information system providing accurate information crucial to an organization?

Good information is accurate information, which is information that is based on correct and complete data, and it has been processed correctly as expected. Accuracy is crucial; managers must be able to rely on the results of their information systems. The IS function can develop a bad reputation in the organization if a system is known to produce inaccurate information. In such a case, the information system becomes a waste of time and money as users develop work-arounds to avoid the inaccurate data.

9) Explain the importance of timeliness of information in an organization.

Timely information is information that is produced in time for its intended use. A monthly report that arrives 6 weeks late is most likely useless. The information arrives long after the decisions have been made that needed that information. An information system that tells you not to extend credit to a customer after you have shipped the goods is unhelpful and frustrating. Notice that timeliness can be measured against a calendar (6 weeks late) or against events (before we ship).

10) In some cases, developing systems that provide information in near real time is much more difficult and expensive than producing information a few hours later. Provide an example that supports this statement.

A person who works in marketing needs to be able to assess the effectiveness of new online ad programs. He wants an information system that will not only deliver ads over the Web, but one that will also enable him to determine how frequently customers click on those ads. In this case, determining click ratios in near real time will be very expensive; saving the data in a batch and processing it some hours later will be much easier and cheaper.

If you can live with information that is a day or two old, the system will be easier and cheaper to implement.

11) Define relevant information. Explain the importance of relevant information in an organizational context.

Relevant information is information that directly pertains to both the context and to the subject it references. Considering context, you, the CEO, need information that is summarized to an appropriate level for your job. A list of the hourly wage of every employee in the company is unlikely to be useful. More likely, you need average wage information by department or division.

A list of all employee wages is irrelevant in your context.

Information should also be relevant to the subject at hand. If you want information about short-term interest rates for a possible line of credit, then a report that shows 15-year mortgage interest rates is irrelevant.

12) Explain the importance of just barely sufficient information in the information age we live in.

Just barely sufficient information is information that is sufficient for the purpose for which it is generated, but only so. We live in an information age; one of the critical decisions that each of us has to make each day is what information to ignore. The higher you rise into management, the more information you will be given, and because there is only so much time, the more information you will need to ignore. So information should be sufficient, but just barely.

13) What are the costs associated with information? When is information considered to be worth its cost?

Information is not free. There are costs for developing an information system, costs of operating and maintaining that system, and costs of your time and salary for reading and processing the information the system produces. For information to be worth its cost, an appropriate relationship must exist between the cost of information and its value.

14) List the two major benefits of an information system.

The two major benefits of an information system are:

1. Labor savings
2. More data that can be processed for more information

15) What role does an individual's thinking play in the five components of an information system?

When you consider the five components of an information system, the last component, people, includes you. Your mind and your thinking are not merely a component of the information systems you use; they are the most important component. Even if you have the perfect information system, if you do not know what to do with the information that it produces, you are wasting your time and money. The quality of your thinking is a large part of the quality of the information system.

Chapter 3: Organizational Strategy, Information Systems, and Competitive Advantage

Notes from Multiple Choice Questions

The competitive strategy followed by an organization is derived from its **structure**.

The competitive strategy of an organization determines its **value chains**.

In which of the following situations would the suppliers have the strongest bargaining power?
Coffee planters during a season of frost that decreases production

Porter originally developed the five forces model to determine **the potential profitability of an industry**.

Simpson's Lawn Services decides to offer two free mowing services for all customers who booked garden landscaping in the fall. By doing this, which of the following forces is Simpson's addressing?

The threat posed by Roger's Landscapes, a new competitor

Porter's five competitive forces can be grouped into two types: **forces related to competition and forces related to supply chain bargaining power**.

Porter's model includes the bargaining power of which of the following groups as one of the five factors?

Customers

In Porter's five factor model, each of the three competitive forces concerns the danger of **customers taking their business elsewhere**.

Two strength factors that relate to all three competitive forces are **switching costs** and customer loyalty.

In which of the following cases is the strength of competitive forces low?

When switching costs are high

If customers perceive the benefits of a substitute to be similar to that of a product then **the threat from the substitute is strong.**

The strength of bargaining power forces depends on the **availability of substitutes and the relative size of the firm** compared to the size of suppliers or customers.

An organization responds to the structure of its industry by choosing a **competitive** strategy

If a company produces a uniquely formulated anti-ageing face cream targeted at women above the age of forty, which of the following competitive strategies is it following?

Focused differentiation

Which of the following is an example of a competitive strategy employed by a firm? **Launching a unique product targeted at a section of consumers**

According to Porter, to be effective the organization's goals, objectives, culture, and activities must be consistent with the **organization's strategy.**

Porter defined **value** as the amount of **money that a customer is willing to pay** for a resource, product, or service.

Which of the following is true of a **value-chain**?

It is a network of value-creating activities.

A business that selects a differentiation strategy would **add cost to an activity provided it has a positive margin.**

The difference between the **value that an activity generates** and the **cost of the activity** is called the **margin.**

Collecting, storing, and physically distributing the product to buyers describes which of the following primary activities?

Outbound logistics

Inducing buyers to purchase the product and providing a means for them to do so describes which of the following primary activities?

Sales and marketing

Each stage of the value chain not only adds value to the product but also accumulates costs.

Which of the following is a primary activity in the value chain?

Delivering products to consumers

Firm infrastructure includes general management, finance, accounting, legal, and government affairs.

Porter's model of business activities includes linkages, which are interactions across value activities.

Manufacturing systems that include linkages, use sales forecast to plan production.

Manufacturing systems use linkages to reduce inventory costs.

As Porter says, the processes and systems in an organization pursuing differentiation must **create sufficient value to cover their costs**.

If a value chain's margin is positive, the company must **retain its present practices**.

Organizations gain a **competitive advantage** by creating new products or services, **enhancing products and services** and by differentiating their products and services from those of their competitors.

Which of the following is a product implementation principle of competitive advantage?
Enhance goods or services

Which of the following strategies is also called **establishing high switching costs**?
Locking in customers

Which of the following is a process implementation principle of competitive advantage?
Establishing alliances

Which of the following is **least** likely to be an outcome of organizations **forming alliances** with each other?
Increase in mutual competitiveness

Essay Questions

1) Briefly describe how organizational strategy determines the structure of information systems.

Organizations examine the **structure** of their industry and, from that, develop a **competitive strategy**. That strategy determines **value chains**, which, in turn, determine **business processes**. The nature of business processes determines the **requirements and functions of information systems**.

2) Describe Porter's five forces model.

Organizational strategy begins with an assessment of the fundamental characteristics and structure of an industry. **A model used to assess an industry structure is Porter's five forces**

model. Porter's five competitive forces can be grouped into two types: **forces related to competition and forces related to supply chain bargaining power**. The competitive forces are: competition from vendors of substitutes, competition from new competitors, and competition from existing rivals. The bargaining power forces include the bargaining power of suppliers and the bargaining power of customers. The intensity of each of the five forces determines the characteristics of the industry, how profitable it is, and how sustainable that profitability will be. Organizations examine these five forces and determine how they intend to respond to them. That examination leads to competitive strategy.

3) What are the **four competitive strategies based on Porter's five forces model?**

An organization responds to the structure of its industry by choosing a competitive strategy. Porter followed his five forces model with the model of four competitive strategies. According to Porter, a firm can engage in one of these four fundamental competitive strategies. An organization can focus on being **the cost leader**, or it can focus on **differentiating** its products from those of the competition. Further, the organization can employ the cost or differentiation strategy **across an industry** or it can focus its strategy on a **particular industry** segment. According to Porter, to be effective the organization's goals, objectives, culture, and activities must be consistent with the organization's strategy.

4) How does competitive strategy determine value chain structure?

Porter defined **value** as the amount of money that a customer is willing to pay for a resource, product, or service. A **value chain** is a network of value-creating activities. Organizations analyze the structure of their industry, and, using that analysis, they formulate a competitive strategy. They then need to organize and structure the organization to implement that strategy. If, for example, the competitive strategy is to be a cost leader, then business activities need to be developed to provide essential functions at the lowest possible cost. A business that selects a differentiation strategy would not necessarily structure itself around least-cost activities. Instead, such a business might choose to develop more costly systems, but it would do so only if those systems provided benefits that outweighed their risks.

5) Distinguish between a **primary and a support activity in the value chain.**

Primary activities are business function that relate directly to the production of the organization's

products or services.

Support activities are business functions that assist and facilitate the primary activities.

6) Differentiate between value and margin.

Porter defined value as the amount of money that a customer is willing to pay for a resource, product, or service. The difference between the value that an activity generates and the cost of the activity is called the margin. A business with a differentiation strategy will add cost to an activity only as long as the activity has a positive margin.

7) Describe using an example, the primary activities in a value chain.

In a bicycle manufacturing unit the primary activities of a value chain are followed. The manufacturer acquires raw materials using the inbound logistics activity. This activity concerns the receiving and handling of raw materials and other inputs. The accumulation of those materials adds value in the sense that even a pile of unassembled parts is worth something to some customer. A collection of the parts needed to build a bicycle is worth more than an empty space on a shelf. The value is not only the parts themselves, but also the time required to contact vendors for those parts, to maintain business relationships with those vendors, to order the parts, to receive the shipment, and so forth.

In the operations activity, the bicycle maker transforms raw materials into a finished bicycle, a process that adds more value. Next, the company uses the outbound logistics activity to deliver the finished bicycle to a customer. Of course, there is no customer to send the bicycle to without the marketing and sales value activity. Finally, the service activity provides customer support to the bicycle users.

8) What is a value chain? List the primary activities in a value chain.

A value chain is a network of value-creating activities. The generic value chain developed by Porter consists of five primary activities and three support activities. The primary activities are:

- a. In-bound logistics-which deals with receiving, storing, and disseminating inputs to the product
- b. Operations-which involves transforming inputs into the final product
- c. Out-bound logistics-which deals with collecting, storing, and physically distributing the product to buyers
- d. Marketing and sales-which involves inducing buyers to purchase the product and providing a means for them to do so

e. Customer service-which involves assisting customer's use of the product and thus maintaining and enhancing the product's value

9) Explain value chain linkages.

Porter's model of business activities includes linkages, which are **interactions across value activities**. For example, manufacturing systems use linkages to reduce inventory costs. Such a system uses sales forecasts to plan production; it then uses the production plan to determine raw materials needs and then uses the material needs to schedule purchases. The end result is just-in-time inventory, which reduces inventory sizes and costs.

10) How did Porter define technology, human resources and firm infrastructure?

Porter defined **technology** broadly. It includes **research and development**, but it also includes other activities within the firm for developing new techniques, methods, and procedures. He defined **human resources** as recruiting, compensation, evaluation, and training of full-time and part-time employees. Finally, firm infrastructure includes general management, finance, accounting, legal, and government affairs.

11) Describe the support activities in a value chain.

The support activities in the generic value chain facilitate the primary activities and contribute only indirectly to the production, sale, and service of the product. They include **procurement**, which consists of the processes of finding vendors, setting up contractual arrangements, and negotiating prices. Porter defined **technology** broadly. It includes research and development, but it also includes other activities within the firm for developing new techniques, methods, and procedures. He defined **human resources** as recruiting, compensation, evaluation, and training of full-time and part-time employees. Finally, firm **infrastructure** includes general management, finance, accounting, legal, and government affairs. Supporting functions add value, albeit indirectly, and they also have costs.

12) What is the criterion on which business processes should run?

According to Porter, whether business processes are low-cost or high-service, these processes and systems must create sufficient value that they will more than cover their costs. If not, the margin of those systems will be negative. If a value chain's margin is negative, the company

must make some change. Either the value must be increased, or the costs of the value chain need to be reduced.

13) How can one develop competitive strategies using products? How can information systems help in the process?

Some competitive techniques are created through products and services or created through the development of business processes. There are three principles that concern products and services. Organizations gain a competitive advantage by:

- a. creating new products or services
- b. enhancing existing products or services
- c. differentiating their products and services from those of their competitors

An information system can be part of a product or it can provide support for a product or service.

14) Describe some competitive advantage strategies that are based on business processes.

Some of the competitive strategies that are based on business processes include:

- a. Establishing high switching costs-organizations can lock in customers by making it difficult or expensive for customers to switch to another product.
- b. Lock in suppliers-organizations can lock in suppliers by making it difficult to switch to another organization, or, stated positively, by making it easy to connect to and work with the organization.
- c. Creating entry barriers-competitive advantage can be gained by creating entry barriers that make it difficult and expensive for new competition to enter the market.
- d. Establish alliances-another means to gain competitive advantage is to establish alliances with other organizations.
- e. Finally, by creating better business processes, organizations can gain competitive advantage by reducing costs.

Chapter 4: Hardware and Software

Notes from Multiple Choice Questions

Flatbed plotter is an example of an output hardware device?

Central processing unit is sometimes called the "brain" of the computer?

Which of the following is true of special function cards?

It is added to a computer to augment its basic capacities.

Computers represent data by using **bits**.

A computer with a quad processor has **4** CPUs.

Which of the following patterns represents the value 11011?

Closed; closed; open; closed; closed

The CPU has a small amount of very fast memory called a **cache**.

To execute an instruction, data is moved from the main memory to CPU via the **bus**.

Operating system is a program that controls the computer's resources.

When there is not enough memory to load additional programs in the main memory, the operating system removes some programs/data and replaces it with the newly requested programs/data through a process called **memory swapping**.

CPU speed is expressed in **hertz**.

Which of the following is true of a 32-bit CPU?

It can effectively utilize up to 4GB of main memory.

When contents of the memory are lost when the power is off, the memory is said to be **volatile**.

Which of the following is part of volatile memory?

Cache

Users employ **client** computers for word processing, spreadsheets, database access, and so forth.

Which of the following is true of a client?

They have software that enables them to connect to a network.

Which of the following is true of a server?

Processing shared databases is one of its functions.

For some commercial Web sites, the server is actually a large collection of computers, called a **server farm**, which coordinates all of their activities.

Every computer has a **operating system**, which is a program that controls that computer's resources.

Which of the following is a function of the operating system of a computer?

Performs memory swapping functions

Microsoft Windows works only on processors from Intel and companies that make processors that conform to the Intel **instruction set**.

Programs that control the server computer's resources are **server operating systems**.

Which of the following operating systems is generally used by the scientific community and not by business users?

Unix

An individual buying a computer program **just buys a license to use the product**.

Cloud computing is a form of hardware/software leasing in which organizations obtain server resources from vendors that specialize in server processing.

Virtualization is the process whereby multiple operating systems share the same hardware.

A grocery scanning checkout system is an example of **vertical-market software**.

Software that provides capabilities common across all organizations and industries is known as **horizontal-market application** software.

Which of the following is true of in-house custom-developed software?

The developing company pays the adaptation costs itself.

Firmware software is installed in special, read-only memory in devices like printers or communication devices.

Application programs that require programs other than a browser on a user's computer are called **thick-clients**.

Which of the following is true of thick-client applications?

All other things being equal, thin-client applications are preferred over thick client applications.

Source code is computer code as written by humans and that is understandable by humans.

Essay Questions

1) Describe the basic components of a generic computer.

In a generic computer, hardware consists of electronic components and related gadgetry that input, process, output, and store data according to instructions encoded in computer programs or software. Typical input hardware devices are the keyboard, mouse, document scanners, and bar-code scanners. Processing devices include the central processing unit (CPU), which is sometimes called the brain of the computer. The CPU works in conjunction with main memory. Main memory is sometimes called RAM, for random access memory. Computers also can have special function cards that can be added to the computer to augment the computer's basic capabilities. Output hardware consists of video displays, printers, audio speakers, overhead projectors, and other special-purpose devices. Storage hardware saves data and programs. The magnetic disk is by far the most common storage device, although optical disks such as CDs and DVDs also are popular.

2) What are bits? Explain the various methods of representing binary notation.

Computers represent data using binary digits called bits. A bit is either a zero or a one. Bits are used for computer data because they are easy to represent physically and electronically.

Binary notations are sometimes represented through switches. A switch can be either closed or open. A computer can be designed so that an open switch represents zero and a closed switch represents one.

The orientation of a magnetic field is also used to represent a bit; magnetism in one direction represents a zero, magnetism in the opposite direction represents a one.

Finally, for optical media, small pits are burned onto the surface of the disk so that they will reflect light. In a given spot, a reflection means a one; no reflection means a zero.

3) Describe how computer data is sized.

All computer data are represented by bits. The data can be numbers, characters, currency amounts, photos, recordings, or whatever. All are simply a string of bits. Bits are grouped into 8-bit chunks called bytes. For character data, such as the letters in a person's name, one character will fit into one byte. Bytes are used to measure sizes of noncharacter data as well. For example, a given picture can be said to be 100,000 bytes in size. This statement means the length of the bit string that represents the picture is 100,000 bytes or 800,000 bits (because there are 8 bits per

byte).

The specifications for the size of main memory, disk, and other computer devices are expressed in bytes. A kilobyte, abbreviated K, is a collection of 1,024 bytes. A megabyte, or MB, is 1,024K kilobytes. A gigabyte, or GB, is 1,024 megabytes, and a terabyte, or TB, is 1,024 gigabytes.

4) Briefly describe how a computer works.

The CPU (central processing unit) is the major actor. To run a program or process data, the CPU must first transfer the program or data from disk to main memory. Then, to execute an instruction, it moves the instruction from main memory into the CPU via the data channel or bus. The CPU has a small amount of very fast memory called a cache. The CPU keeps frequently used instructions in the cache. Main memory of the computer contains program instructions for application programs and a browser. It also contains instructions for the operating system. Main memory is too small to hold all of the programs and data that a user may want to process. Consequently, the CPU loads programs into memory in chunks.

If the user opens another program or needs to load more data, the operating system will direct the CPU to attempt to place the new program or data into unused memory. If there is not enough memory, it will remove something, and then it will place the just-requested program or data into the vacated space. This process is called memory swapping.

5) Differentiate between client and server computers.

Users employ client computers for word processing, spreadsheets, database access, and so forth. Most client computers also have software that enables them to connect to a network. Servers provide some service. Some servers process email; others process Web sites; others process large, shared databases; and some provide all of these functions or other, similar functions. Server computers need to be faster, larger, and more powerful than client computers. They usually have multiple CPUs. Servers typically have limited video displays. Many servers have no display at all, because they are only accessed from another computer via the network. For large commerce sites, the server is actually a large collection of computers (called a server farm) that coordinate all of their activities.

6) What are two important software constraints? Explain with suitable examples.

A particular version of an operating system is written for a particular type of hardware. For example, Microsoft Windows works only on processors from Intel and companies

that make processors that conform to the Intel instruction set (the commands that a CPU can process). Furthermore, the 32-bit version of Windows runs only on Intel computers with 32-bit CPUs, and the 64-bit version of Windows runs only on Intel computers with 64-bit CPUs.

Second, application programs are written to use a particular operating system.

Microsoft Access, for example, will run only on the Windows operating system. Some applications come in multiple versions. There are, for example, Windows and Macintosh versions of Microsoft Word. But unless informed otherwise it is safe to assume that a particular application runs on just one operating system.

7) Differentiate between an operating system and an application program.

Every computer has an operating system, which is a program that controls that computer's resources. Some of the functions of an operating system are to read and write data, allocate main memory, perform memory swapping, start and stop programs, respond to error conditions, and facilitate backup and recovery. In addition, the operating system creates and manages the user interface, including the display, keyboard, mouse, and other devices. Although the operating system makes the computer usable, it does little application specific work. To write a document or query a customer database, application programs such as Microsoft Word or Oracle Customer Relationship Management (CRM) are needed. These programs must be licensed in addition to the operating system.

8) List the four major operating systems and their usages.

The four major operating systems are Windows, Mac OS, Unix, and Linux.

a. For business users, the most important operating system is Microsoft Windows. Some version of Windows resides on more than 85 percent of the world's desktops, and considering just business users, the figure is more than 95 percent. Microsoft offers many different versions of Windows; Windows XP and Vista are current client versions. Windows Server 2008 is the current server version.

b. Apple Computer, Inc., developed its own operating system for the Macintosh, Mac OS. The current system is named Mac OS X. Macintosh computers are used primarily by graphic artists and workers in the arts community.

c. Unix is an operating system that was developed at Bell Labs in the 1970s. It has been the workhorse of the scientific and engineering communities since then. Unix is generally regarded as being more difficult to use than either Windows or the Macintosh.

d. Linux is a version of Unix that was developed by the open-source community. This

community is a loosely coupled group of programmers who mostly volunteer their time to contribute code to develop and maintain Linux. The open-source community owns Linux, and there is no fee to use it. Linux can run on client computers, but it is most frequently used on servers, particularly Web servers.

9) How can individuals and firms buy computer programs?

When one buys a computer program, it does not mean actually buying that program. Instead, it is buying a license, which is the right to use a certain number of copies of that program subject to limits on the vendor's liability.

Large organizations do not buy a license for each computer user. Instead, they negotiate a site license, which is a flat fee payment for the right to install the product (operating system or application) on all of that company's computers or on all of the computers at a specific site.

10) What is unique about Linux as an operating system?

Linux is a version of Unix that was developed by the open source community. In case of Linux, no company can sell a license to use it. It is owned by the open source community, which states that Linux has no license fee (with certain reasonable restrictions). Large companies, such as IBM, and smaller companies, such as Red Hat, can make money by supporting Linux, but no company makes money selling Linux licenses.

11) What is cloud computing?

Cloud computing is a form of hardware/software leasing in which organizations obtain server resources from vendors that specialize in server processing. The amount of server time and the resources leased is flexible and can change dynamically. Customers pay only for resources used. Major companies that offer cloud computing products include Amazon.com, IBM, Microsoft, and Oracle.

12) What is virtualization?

Virtualization is the process whereby multiple operating systems share the same hardware. For example, with virtualization one server can support two instances of Windows Server, one instance of Linux, and three instances of Windows. Because these instances are isolated, it will appear to each that it has exclusive control over the server computer. Because of virtualization, it

is quite easy for cloud vendors to reconfigure servers to support changes in workload.

13) What are the different categories of application programs?

Application software consists of programs that perform a service or a function. Some application programs are general purpose. Other application programs provide specific functions.

a. Horizontal-market application software provides capabilities common across all organizations and industries. Word processors, graphics programs, spreadsheets, and presentation programs are all horizontal-market application software. Examples of such software are Microsoft Word, Excel, and PowerPoint.

b. Vertical-market application software serves the needs of a specific industry. Examples of such programs are those used by dental offices to schedule appointments and bill patients. Vertical applications usually can be altered or customized.

c. One-of-a-kind application software is developed for a specific, unique need. The IRS develops such software, for example, because it has needs that no other organization has.

14) What are the drawbacks of developing custom application software for an organization?

Organizations develop custom application software themselves or hire a development vendor. By developing custom software, the organization can tailor its application to fit its requirements. Custom development is difficult and risky. Staffing and managing teams of software developers is challenging. Managing software projects can be daunting. Many organizations have embarked on application development projects only to find that the projects take twice as long—or longer—to finish as planned. For custom software developed in-house the developing company must pay all of the adaptation costs itself. Over time, this cost burden is heavy. Because of the risk and expense, in-house development is the last-choice alternative and is used only when there is no other option.

15) What is firmware?

Firmware is computer software that is installed into devices such as printers, print servers, and various types of communication devices. The software is coded just like other software, but it is installed into special, read-only memory of the printer or other device. In this way, the program becomes part of the device's memory; it is as if the program's logic is designed into the device's circuitry. Users do not need to load firmware into the device's memory. Firmware can be

changed or upgraded, but this is normally a task for IS professionals. The task is easy, but it requires knowledge of special programs and techniques that most business users choose not to learn.

Chapter 5: Database Processing

Notes from Multiple Choice Questions

The purpose of a database is to **keep track of things that involve more than one thing**.

A **database** is a self-describing collection of integrated records.

Which of the following describes a byte?

A character of data

Characters of data are grouped into **columns**.

Bytes are grouped into columns, which are also called **fields**.

Columns are grouped into **rows**, which are also called **records**.

A collection of fields is called a **record**.

A group of similar rows or records is called a **table**.

A table is also called a **file**.

What is metadata?

Special data that describes the structure of a database

A **key** is a column or group of columns that identifies a unique row in a table.

Columns that are keys of a different table than the one in which they reside are known as **foreign keys**.

Databases that carry their data in the form of tables are called **relational** databases.

A more formal name for a table is **relation**.

Data type and description are examples of **metadata**.

The name of the field, the data type, and the number of characters allowed would be an example of **metadata**.

A **database application system** is an assembly of forms, reports, queries, and application programs that process a database.

DBMS software programs assist in creating and maintaining databases.

Which of the following is a DBMS product from Microsoft?

SQL Server

DB2 is a popular enterprise DBMS from IBM.

Database developers use the **DBMS** to create relationships in the database.

Which of the following is a function of the DBMS?

Processing the database

For which of the following operations do applications use DBMS?

Modify data

Structured Query Language is an international standard language for processing a database.

SQL stands for **Structured Query Language**.

During which of the following functions of a database are tools provided for assistance?

Administering the database

A **database application** is a collection of reports, forms, and queries that process a database.

Data entry forms are used to read, insert, modify, and delete data.

In a typical database application, a **report** shows data in a structured context.

To locate something in the database, one must type in the keyword into the **query form** of the application.

Which of the following is true of database application?

Application programs process logic that is specific to a given business need.

The **lost-update** problem is unique to a multiuser database processing.

Enterprise DBMS process(es) large organizational and workgroup databases.

Personal DBMS products are designed **for smaller, simpler database applications.**

Which of the following is an example of enterprise DBMS?

MySQL

FoxPro is an example of personal DBMS.

Which of the following stands true for enterprise DBMS products?

Enterprise DBMS products support many (perhaps thousands) of users and many different database applications.

Which of the following stands true for personal DBMS products?

Personal DBMS products are designed for simple database applications.

Which of the following is the most significant personal DBMS product available in the market today? **MS Access**

Access is both a DBMS and an application development product.

Essay Questions

1) What are the differences between a spreadsheet and a database?

The purpose of both, a spreadsheet and a database is to keep track of things. However, unlike a spreadsheet, a database offers the solution of being able to keep track of more than one type of data. If the structure of a list is simple enough, there is no need to use database technology.

However, lists that involve multiple themes require a database.

2) Describe the contents of a database.

A database is a self-describing collection of integrated records that is organized based on a hierarchy of data elements. A byte is a character of data. Bytes are grouped into columns. Columns are also called fields. A key is a column or group of columns that identifies a unique row in a table. Columns that are keys of a different table than the one in which they reside are called foreign keys. Columns or fields, in turn, are grouped into rows, which are also called records. Finally, a group of similar rows or records is called a table or a file. A database contains, within itself, a description of its contents. Metadata are data that describe data. Thus, a database is a collection of tables plus relationships among the rows in those tables, plus special data, called metadata, that describes the structure of the database.

3) What are relational databases?

Databases that carry their data in the form of tables that represent relationships using foreign keys are called relational databases. Foreign keys are columns that are keys of a different table than the one in which they reside. (The term relational is used because another, more formal name for a table is relation.) In the past, there were databases that were not relational in format, but such databases have nearly disappeared.

4) Describe the usefulness of metadata.

A database is self-describing in that it contains, within itself, a description of its contents. This is because it contains not only data, but also data about the data in the database. This data is known as metadata. It is the presence of metadata that makes databases much more useful than spreadsheets or data in other lists. Because of metadata, no one needs to guess, remember, or even record what is in the database. To find out what a database contains, we just look at the metadata inside the database.

5) What is the function of a database application system?

A database, all by itself, is not very useful. Pure database data are correct, but in raw form they are not pertinent or useful. A database application system makes database data more accessible and useful. Users employ a database application that consists of forms, formatted reports, queries, and application programs. Each of these, in turn, calls on the database management

system (DBMS) to process the database tables.

6) Explain database management systems.

A database management system (DBMS) is a program used to create, process, and administer a database. A DBMS is different from a database in that a DBMS is a software program while a database is a collection of tables, relationships, and metadata.

Almost no organization develops its own DBMS. Instead, companies license DBMS products from vendors such as IBM, Microsoft, Oracle, and others. Popular DBMS products are DB2 from IBM, Access and SQL Server from Microsoft, and Oracle from the Oracle Corporation. Another popular DBMS is MySQL, an open-source DBMS product that is free for most applications.

7) How does one create a database and its structures?

Database developers use the DBMS to create tables, relationships, and other structures in the database. A form is used to define a new table or to modify an existing one. To create a new table, the developer just fills out a new form.

To modify an existing table—for example, to add a new column—the developer opens the metadata form for that table and adds a new row of metadata. For example, the developer adds a new column called "Response?" to a table. This new column has the data type Yes/No, which means that the column can contain only one of the values—Yes or No. The person using this form will use this column to indicate whether he/she has responded to the student's email. Other database structures are defined in similar ways.

8) Describe the functions of a database management system.

A database management system (DBMS) is a program used to create, process, and administer a database.

a. Database developers use the DBMS to create tables, relationships, and other structures in the database. To create a new table, the developer just fills out a new form. To modify an existing table—for example, to add a new column—the developer opens the metadata form for that table and adds a new row of metadata.

b. The second function of the DBMS is to process the database. Applications use the DBMS for four operations: to read, insert, modify, or delete data. The applications call upon the DBMS in different ways. From a form, when the user enters new or changed data, a computer program that processes the form calls the DBMS to make the necessary database changes. From an application

program, the program calls the DBMS directly to make the change.

c. A third DBMS function is to provide tools to assist in the administration of the database.

Database administration involves a wide variety of activities. For example, the DBMS can be used to set up a security system involving user accounts, passwords, permissions, and limits for processing the database.

d. In addition to security, DBMS administrative functions include backing up database data, adding structures to improve the performance of database applications, removing data that are no longer wanted or needed, and similar tasks.

9) Define SQL.

Structured Query Language (SQL) is an international standard language for processing a database. All DBMS products accept and process SQL statements. One need not understand or remember SQL language syntax. Instead, realize that SQL is an international standard for processing a database. Also, SQL can be used to create databases and database structures.

10) What is a database application?

A database application is a collection of forms, reports, queries, and application programs that process a database. A database may have one or more applications, and each application may have one or more users. These applications have different purposes, features, and functions, but they all process the same inventory data stored in a common database.

11) Briefly describe the elements of a database application.

A database application is a collection of forms, reports, queries, and application programs that process a database. Data entry forms are used to read, insert, modify, and delete data. Reports show data in a structured context. DBMS programs provide comprehensive and robust features for querying database data. The DBMS provides a facility to type in a keyword into a query form to find what one is looking for.

There are also database application programs for applications that have unique requirements that a simple form, report, or query cannot meet.

12) How are database application programs useful?

Most applications have unique requirements that a simple form, report, or query cannot meet. In

such cases, data application programs come into play. Application programs process logic that is specific to a given business need, and enable database processing over the Internet. For this use, the application program serves as an intermediary between the Web server and the database. The application program responds to events, such as when a user presses a submit button; it also reads, inserts, modifies, and deletes database data.

13) How can one prevent the lost-update problem of multiuser processing?

The lost-update problem exemplifies one of the special characteristics of multiuser database processing. To prevent this problem, some type of locking must be used to coordinate the activities of users who know nothing about one another.

14) Explain enterprise DBMS products.

DBMS products fall into two broad categories. One of these categories is enterprise DBMS products that process large organizational and workgroup databases. These products support many (perhaps thousands) of users and many different database applications. Such DBMS products support 24/7 operations and can manage databases that span dozens of different magnetic disks with hundreds of gigabytes or more of data. IBM's DB2, Microsoft's SQL Server, and Oracle's Oracle are examples of enterprise DBMS products.

15) What are personal DBMS products?

DBMS products fall into two broad categories. One of these categories is personal DBMS products which are designed for smaller, simpler database applications. Such products are used for personal or small workgroup applications that involve fewer than 100 users, and normally fewer than 15. In fact, the great bulk of databases in this category have only a single user. In the past, there were many personal DBMS products - Paradox, dBase, R:base, and FoxPro. Today, the only remaining personal DBMS of significance is Microsoft Access.

Chapter 6: Data Communications

Notes from Multiple Choice Questions

The distinguishing characteristic of a LAN is **that it connects at a single location**.

A **WAN** connects computers at different geographic locations.

The computers in two separate company sites must be connected using a **WAN**.

A **layered protocol** is used to provide seamless flow of data across networks.

A **protocol** is a set of rules that two communicating devices follow.

A **switch** is a special-purpose computer that receives and transmits wired traffic on the LAN.

Each device on the LAN has a hardware component called the **NIC** that connects the device's circuitry to the cable.

Most LAN connections are made using **UTP** cables.

In order for a printer or a laptop to connect to a wireless LAN, it must have a **WNIC**.

The WNIC devices connect to an **access point**, which is the component of the LAN device that processes wireless traffic and communicates with the wired switch.

The IEEE 802.3 protocol standard is also known as **Ethernet**.

Which protocol standard used for wired LAN connections specifies hardware characteristics, such as which wires carry which signals?

Ethernet

Which of the following statements about LAN protocols is true?

The access point uses both the 802.3 and 802.11 standards.

Bluetooth is a common wireless protocol used for transmitting data over short distances.

Which of the following protocols is commonly used by LAN?

IEEE 802.11g

What is the protocol commonly used for wireless LAN?

IEEE 802.11g

Which of the following is true of an ISP?

It serves as a user's gateway to the Internet.

A **modem** must be used to convert a computer's digital data to an analog, or wavy, signal.

Which of the following is true of DSL modems?

Their signals do not interfere with voice telephone service.

What is the performance guarantee offered by SDSL connections?

They offer the same fast speed in both directions.

Most homes and small businesses use **ADSL** because they receive more data than they transmit.

Businesses that need DSL lines that have the same receiving and transmitting speeds would use **SDSL**.

Which of the following is true of cable modems?

The signals from cable modems do not interfere with TV signals.

Narrowband lines typically have transmission speeds less than **56 kbps**.

Which of the following purposes does an HTTP protocol serve?

Enable communication among programs

The S in HTTPS stands for **secure**.

One very common use of FTP is to **maintain websites**.

Which of the following provides reliable internet transport?

TCP

The **web** is the Internet-based network of browsers and servers that process HTTP or HTTPS.

When an individual uses the Internet, but not the Web, he or she is using **FTP**.

What is an IP address?

It is a number that identifies a particular device.

A **domain name** is a unique name that is affiliated with a public IP address.

Which of the following means an address on the internet?

URL

Which of the following is a component of the user tier?

Computers that have browsers that request and process Web pages

In the three-tier architecture arrangement, what is the second tier?

Server tier

A **commerce server** receives requests from users via the Web server, takes some action, and returns a response to the users via the Web server.

Which of the following is true of Web servers?

They send and receive Web pages to and from clients.

HTML is the most common language for defining the structure and layout of Web pages.

What is a VPN?

It uses the Internet to create private point-to-point connections.

Which of the following is true of VPN?

VPN communications are secure even though they are transmitted over the public Internet.

Essay Questions

1) What is the difference between a LAN and a WAN? Give an example of how each one could be used in business.

A local area network (LAN) connects computers that reside in a single geographic location on the premises of the company that operates the LAN. Wide area networks (WANs) connect computers at different geographic locations. The computers in two separated company sites must be connected using a WAN. With a LAN, the number of connected computers can range from two to several hundred, but they are still in a single location (usually within a building or floor of a building). Most small businesses have a LAN in place in their office that connects them. For example: a university campus uses a backbone (usually fiber optic) to connect all the different buildings on the campus and possibly multiple campuses on the university's WAN.

2) What is an NIC? Why is it important to LAN?

Each wired computer or printer on the LAN has a network interface card (NIC), which is a device that connects the computer's or printer's circuitry to the network cables. The NIC works with programs in each device to implement the protocols necessary for communication. Most computers today ship from the factory with an onboard NIC, which is an NIC built into the computer's circuitry.

3) How does a wireless NIC work?

The WNIC devices connect to an access point, which is the component of the LAN device that processes wireless traffic and communicates with the wired switch. Thus, with this design every device on the LAN, whether wired or wireless, can communicate with every other device.

Wireless devices communicate to each other via the access point. If wireless devices need to connect to a wired device, they do so via the access point, then to the switch, and then to the wired devices.

Similarly, wired devices communicate to each other via the switch. If the wired devices need to connect to wireless ones, they do so via the switch, then to the access point, and then to the wireless devices.

4) What is Bluetooth? What are its uses?

Bluetooth is a common wireless protocol. It is designed for transmitting data over short distances, replacing cables. Some devices, such as wireless mice and keyboards, use Bluetooth to connect to the computer. Cell phones use Bluetooth to connect to automobile entertainment systems.

5) What are the three important functions of an ISP?

An ISP has three important functions. First, it provides the client with a legitimate Internet address. Second, it serves as a gateway to the Internet. The ISP receives the communications from the client's computer and passes them on to the Internet, and it receives communications from the Internet and passes them on to the client. Finally, ISPs pay for the Internet. They collect money from their customers and pay access fees and other charges on their behalf.

6) Identify the differences between ADSL and SDSL.

DSL lines that have different upload and download speeds are called asymmetric digital subscriber lines (ADSL). Most homes and small businesses can use ADSL because they receive more data than they transmit (e.g., pictures in news stories), and hence they do not need to transmit as fast as they receive.

Some users and larger businesses need DSL lines that have the same receiving and transmitting speeds. They also need performance-level guarantees. Symmetrical digital subscriber lines (SDSL) meet this need by offering the same fast speed in both directions.

7) What are cable modems?

Cable modems provide high-speed data transmission using cable television lines. The cable company installs a fast, high-capacity optical fiber cable to a distribution center in each neighborhood that it serves. At the distribution center, the optical fiber cable connects to regular cable-television cables that run to subscribers' homes or businesses.

Cable modems modulate in such a way that their signals do not interfere with TV signals. Because up to 500 user sites can share these facilities, performance varies depending on how many other users are sending and receiving data. At the maximum, users can download data up to 50 Mbps and can upload data at 512 kbps.

8) What is the IP protocol architecture?

The protocols used on the Internet are arranged according to a structure known as the TCP/IP Protocol (TCP/IP) architecture, which is a scheme of five protocol types arranged in layers. The top layer concerns protocols for applications such as browsers and Web servers. The next two layers concern protocols about data communications across any internet, including the Internet. The bottom two layers involve protocols that concern data transmission within a network. For example, the IEEE 802.3 and 802.11 LAN protocols operate at the bottom two layers.

9) Name some common application layer protocols.

The TCP/IP application layer protocols are common. SMTP, or Simple Mail Transfer Protocol, is used for email transmissions (along with other protocols as well). And FTP, or File Transfer Protocol, is used to move files over the Internet. One very common use for FTP is to maintain Web sites. When a Web site administrator wishes to post a new picture or story on a Web server, the administrator will often use FTP to move the picture or other item to the server.

10) Explain Transmission Control Protocol (TCP).

The most important protocol in the transport layer is TCP, or Transmission Control Protocol. As a transport protocol, TCP has many complicated functions. One easily understood function, is that TCP programs break traffic up into pieces and send each piece along its way. It then works with TCP programs on other devices on the internet to ensure that all of the pieces arrive at their destination. If one or more pieces is lost or damaged, TCP programs detect that condition and cause retransmission of that piece. Hence, the TCP layer is said to provide reliable internet transport.

11) Differentiate between private and public IP addresses.

Public IP addresses identify a particular device on the public Internet. Because public IP addresses must be unique, worldwide, their assignment is controlled by a public agency known as ICANN (Internet Corporation for Assigned Names and Numbers). Private IP addresses identify a particular device on a private network, usually on a LAN. Their assignment is controlled within the LAN, usually by the device labeled “LAN Device”.

12) What is a domain name? What is the procedure to get a domain name?

A domain name is a unique name that is affiliated with a public IP address. When an

organization or individual wants to register a domain name, it goes to a company that applies to an ICANN-approved agency to do so. The company will first determine if the desired name is unique, worldwide. If so, then it will apply to register that name to the applicant. Once the registration is completed, the applicant can affiliate a public IP address with the domain name. From that point onward, traffic for the new domain name will be routed to the affiliated IP address.

13) What are the three tiers in the three-tier architecture?

Almost all e-commerce applications use the three-tier architecture, which is an arrangement of user computers and servers into three categories, or tiers. The user tier consists of computers, phones, and other devices that have browsers that request and process Web pages. The server tier consists of computers that run Web servers and process application programs. The database tier consists of computers that run a DBMS that processes SQL requests to retrieve and store data.

14) What is the difference between a web server and a commerce server?

Web servers are programs that run on a server tier computer and that manage HTTP traffic by sending and receiving Web pages to and from clients. A commerce server is an application program that runs on a server tier computer. A commerce server receives requests from users via the Web server, takes some action, and returns a response to the users via the Web server. Typical commerce server functions are to obtain product data from a database, manage the items in a shopping cart, and coordinate the checkout process.

15) What is a VPN and how does it work?

VPN stands for a virtual private network and is an alternative to a WAN. A VPN uses the Internet or a private internet to create the appearance of private point-to-point connections. This connection, called a tunnel, is a virtual, private pathway over a public or shared network from the VPN client to the VPN server.

Chapter 7: Business Process Management

Notes from Multiple Choice Questions

Information silos occur when data are isolated in separated information systems.

Which of the following is true for personal information systems?

Such systems have only one user and hence procedures need not be documented or formalized in any way.

Which of the following is an example of a personal information system?

Contact manager

Which of the following statements of enterprise information systems is true?

It supports 100 to 1000 users.

Which of the following is true for workgroup information systems?

Typically workgroup systems support 10 to 100 users.

Which of the following is an example of a workgroup information system?

Accounts payable system

A Web store front is an example of a **functional information system**.

Which of the following stands true for enterprise information systems?

The solutions to problems in an enterprise system usually involve more than one department.

Interenterprise information systems are information systems that are shared by two or more independent organizations.

Ordering of restaurant supplies from suppliers is an example of an interenterprise information system.

Information silos arise as a result of **an organization's growth and increasing use of information systems**

An information silo is also known as an **island of automation**.

Which of the following applications falls under the common departmental information system of sales and marketing?

Lead generation

As a common departmental information system, **Operations** includes order management.

Planning and scheduling are applications that fall under **manufacturing**.

Order tracking and account tracking are applications of **customer service**.

Compensation is an application of the human resources department.

The summation of all the problems of information silos leads to **increased costs for the organization**.

Which of the following is a consequence of isolated information systems?

There is a lack of integrated enterprise information.

Business process reengineering is the activity of altering and designing business processes to take advantage of new information systems.

Which of the following is true for business process reengineering?

In the process of business process reengineering, systems analysts need to interview key personnel throughout the organization to determine how best to use the new technology.

Inherent processes are predesigned procedures for using the software products.

A **customer relationship management system** is a suite of applications, a database, and a set of inherent processes for managing all the interactions with the customer, from lead generation to customer service.

Which of the following sentences is true about customer relationship management system (CRM)?

CRM systems vary in the degree of functionality they provide.

The first step of the customer life cycle is marketing which involves **sending messages to the target audience to attract customer prospects.**

When prospects become customers who need to be supported, the organization is in the **customer acquisition** stage of the customer life cycle.

Which of the following is a component of relationship management?

Increasing the value of existing customers by selling them more product

During which stage of the customer life cycle do win-back processes categorize customers according to value?

Loss

Churning is the last stage of the customer life cycle.

Enterprise resource planning is a suite of applications, a database, and a set of inherent processes for consolidating business operations into a single, consistent, computing platform.

Which of the following is true about enterprise resource planning (ERP)?

ERP systems are used to forecast sales and to create manufacturing plans and schedules to meet those forecasts.

SAP is the worldwide leader of ERP vendors.

EAI is a suite of software applications that integrates existing systems by providing layers of software that connect applications together.

Which of the following is a function of EAI?

It enables a gradual move to ERP

Which of the following statements is true of EAI?

EAI leverages existing systems—leaving functional applications as is, but providing an

integration layer over the top.

When implementing new enterprise systems, the only solution for resolving process issues and providing enterprise process management is **establishing clear and absolute contractual guidelines.**

Gap identification is a major task when implementing enterprise systems.

Which of the following is true about the challenges of requirements gaps?

To specify a gap, an organization must know both what it needs and what the new product does.

Self-efficacy is a person's belief that he or she can be successful at his or her job.

Essay Questions

1) What are personal information systems?

Personal information systems are information systems used by a single individual. The contact manager in an iPhone or in an email account is an example of a personal information system. Because such systems have only one user, procedures are simple and probably not documented or formalized in any way.

It is easy to manage change to personal information systems. Because there is a sole user of the new system, if new procedures are required, only one person needs to adapt. And, if there are problems, he/ she can solve the problems themselves.

2) Explain workgroup information systems.

A workgroup information system is an information system that is shared by a group of people for a particular purpose. For example, the personnel who maintain golf courses, club lawns, and gardens share a workgroup information system for scheduling tasks and employees to accomplish those tasks.

Workgroup information systems that support a particular department are sometimes called departmental information systems. An example is the accounts payable system that is used by the

accounts payable department. Other workgroup information systems support a particular business function and are called functional information systems. An example of a functional system is a Web storefront.

Typically workgroup systems support 10 to 100 users. The procedures for using them must be understood by all members of the group. Often, procedures are formalized in documentation, and users are sometimes trained in the use of those procedures. When problems occur, they almost always can be solved within the group.

3) What are enterprise information systems?

Enterprise information systems are information systems that span an organization and support activities in multiple departments. For example, at a country club resort, the restaurant, the golf courses, the wedding events departments all use the same enterprise information system to record sales.

Enterprise information systems typically have hundreds to thousands of users. Procedures are formalized and extensively documented; users undergo formal procedure training. Sometimes enterprise systems include categories of procedures, and users are defined according to levels of expertise with the system as well as by levels of security authorization.

The solutions to problems in an enterprise system usually involve more than one department. Because enterprise systems span many departments and involve potentially thousands of users, they are very difficult to change. Changes must be carefully planned, cautiously implemented, and users given considerable training. Sometimes users are given incentives and other inducements to motivate them to change.

4) Explain interenterprise information systems.

Interenterprise information systems are information systems that are shared by two or more independent organizations. At a club house, for example, the information system that a restaurant uses to order supplies and ingredients from its suppliers is an interorganizational system. Because such systems are used by employees of different organizations, procedures are formalized and user training is mandatory.

Such systems typically involve thousands of users, and solutions to problems require cooperation

among different, usually independently owned, organizations. Problems are resolved by meeting, contract, and sometimes by litigation.

Data are often duplicated between organizations, but such duplication is carefully managed. Because of the wide span, complexity, and multiple companies involved, such systems can be exceedingly difficult to change. The interaction of independently owned and operated information systems is required.

5) What are information silos?

Information silos are a condition that exists when data are isolated in separated information systems. Isolated systems are referred to as silos, because when drawn in diagrams they appear as long vertical columns—like grain silos.

Information silos are created over time, as information systems are implemented to support personal and workgroup applications. As organizations grow, however, at some point such silos will duplicate data and become a source of potentially serious problems.

6) What are common departmental applications?

Common departmental applications are systems created to support a given department's information processing needs. They work fine for those departments. For example, the sales and accounting department of a company handles applications like lead generation and sales forecasting and the manufacturing department of an organization handles applications like inventory, planning, scheduling, etc. However, functional applications duplicate large amounts of data and are likely to cause problems.

7) What problems do information silos cause?

As organizations grow, information silos will eventually duplicate data and become a source of potentially serious problems. First, data are duplicated because each application has its own database. If, for example, accounting and sales/marketing applications are separated, customer data will be duplicated and may become inconsistent. Changes to customer data made in the sales/marketing application may take days or weeks to reach the accounting application's database. During that period, shipments will reach the customer without delay, but invoices will be sent to the wrong address.

Next, when applications are isolated, business processes are disjointed. A consequence of such disjointed systems is the lack of integrated enterprise information. For example, suppose sales and marketing wants to know if XYZ is still a preferred customer. Suppose that determining whether this is so requires a comparison of order history and payment history data. However, with information silos, that data will reside in two different databases and, in one of them, XYZ is known by the name of the company that acquired it. Data integration will be difficult. Making the determination will require manual processes and days, when it should be readily answered in seconds.

This leads to the fourth consequence: inefficiency. When using isolated functional applications, decisions are made in isolation. Without integration, the left hand of the organization doesn't know what the right hand of the organization is doing.

Finally, information silos can result in increased cost for the organization. Duplicated data, disjointed systems, limited information, and inefficiencies all mean higher costs.

8) What are the ways of eliminating duplicate data?

The fundamental problem of information silos is data that are duplicated and stored in isolated systems. The most obvious fix is to eliminate that duplicated data by storing a single copy of data in a shared database and revising business processes (and applications) to use that database. For this, a database should be created. Then each department should alter its business processes (and applications) to use the shared database. Another remedy is to allow the duplication, but to manage it to avoid problems.

9) What is business process reengineering?

Business process reengineering is the activity of altering and designing business processes to take advantage of new information systems. Unfortunately, business process reengineering is difficult, slow, and exceedingly expensive. Systems analysts need to interview key personnel throughout the organization to determine how best to use the new technology. Because of the complexity involved, such projects require high-level and expensive skills and considerable time. Many early projects stalled when the enormity of the project became apparent. This left some organizations with partially implemented systems that had disastrous consequences. Personnel didn't know if they were using the new system, the old system, or some hacked-up version of both.

10) What are inherent processes?

Inherent processes are predesigned procedures for using software products. They save organizations from expensive and time-consuming business process reengineering. Organizations could license the software and obtain, as part of the deal, prebuilt procedures. There are three categories of such inherent processes: customer relationship management; enterprise resource planning, and enterprise application integration.

11) Write a short note on customer relationship management system (CRM).

A customer relationship management system (CRM) is a suite of applications, a database, and a set of inherent processes for managing all the interactions with the customer, from lead generation to customer service. Every contact and transaction with the customer is recorded in the CRM database. Vendors of CRM software claim using their products makes the organization customer-centric. Though that term reeks of sales hyperbole, it does indicate the nature and intent of CRM packages.

12) Explain the four phases of the customer life cycle.

The four phases of the customer life cycle are marketing, customer acquisition, relationship management, and loss/churn. Marketing sends messages to the target market to attract customer prospects. When prospects order, they become customers who need to be supported. Additionally, relationship management processes increase the value of existing customers by selling them more product. Inevitably, over time the organization loses customers. When this occurs, win-back processes categorize customers according to value and attempt to win back high-value customers.

13) What is ERP?

Enterprise resource planning (ERP) is a suite of applications, a database, and a set of inherent processes for consolidating business operations into a single, consistent, computing platform. ERP includes the functions of CRM, but also incorporates accounting, manufacturing, inventory, and human resources applications.

ERP systems are used to forecast sales and to create manufacturing plans and schedules to meet

those forecasts. Manufacturing schedules include the use of material, equipment, and personnel and thus need to incorporate inventory and human resources applications. Because ERP includes accounting, all of these activities are automatically posted in the general ledger and other accounting applications.

14) Describe enterprise application integration.

Companies for which enterprise resource planning is inappropriate still have the problems of information silos, however, and some choose to use enterprise application integration (EAI) to solve those problems. EAI is a suite of software applications that integrates existing systems by providing layers of software that connect applications together.

Although there is no centralized EAI database, the EAI software keeps files of metadata that describe where data are located. Users can access the EAI system to find the data they need. In some cases, the EAI system provides services that provide a "virtual integrated database" for the user to process.

The major benefit of EAI is that it enables organizations to use existing applications while eliminating many of the serious problems of isolated systems. Converting to an EAI system is not nearly as disruptive as converting to ERP, and it provides many of the benefits of ERP. Some organizations develop EAI applications as a steppingstone to complete ERP systems.

15) What cause the challenges that occur while implementing new enterprise systems?

Implementing new enterprise systems is challenging, difficult, expensive, and risky. It is not unusual for enterprise system projects to be well over budget and a year or more late in delivery. The expense and risks arise from four primary factors: collaborative management, requirements gaps, transition problems, and employee resistance.

Unlike departmental systems in which a single department manager is in charge, enterprise systems have no clear boss. Even the discharge process is a collaborative effort among many departments (and customers). Hence, the enterprise should develop committees and steering groups for providing enterprise process management. Although this can be an effective solution, and in fact may be the only solution, the work of such groups is both slow and expensive.

Few organizations today create their own enterprise systems from scratch. Instead, they license

an enterprise product that provides specific functions and features and that includes inherent procedures. But, such licensed products are never a perfect fit. Almost always there are gaps between the requirements of the organization and the capabilities of the licensed application. Identifying these gaps and deciding what to do with these gaps can be very challenging.

Transitioning to a new enterprise system is also difficult. The organization must somehow change from using isolated departmental systems to using the new enterprise system, while continuing to run the business. Transitions require careful planning and substantial training. Inevitably, problems will develop. Knowing this will occur, senior management needs to communicate the need for the change to the employees and then stand behind the new system as the kinks are worked out. It is an incredibly stressful time for all involved employees.

People resist change for various reasons. Change requires effort and it engenders fear. Hence, senior-level management needs to communicate the need for the change to the organization and must reiterate that, as necessary, throughout the transition process. To enhance confidence, employees need to be trained and coached on the successful use of the new system. Also, employees may need to be given extra inducement to change to the new system. Implementing new enterprise systems can solve many problems and bring great efficiency and cost savings to an organization, but it is not for the faint of heart.

Chapter 8: E-Commerce, Web 2.0, and Social Networking

Notes from Multiple Choice Questions

E-commerce is the buying and selling of goods and services **over private and public computer networks**.

Which of the following has enabled thin-client applications to have considerable functionality?
Increased capabilities of browsers

Which of the following is true of Web 2.0?
It makes use of user-generated content and is flexible.

Which of the following was a supporting technology of pre-Internet systems?
EDI

Enterprise 2.0 is the application of Web 2.0 technologies, collaboration systems, social networking, and related technologies to facilitate the cooperative work of intellectual workers in organizations.

Emergence is a key principle of Enterprise 2.0.

Which of the following is true of Social CRM?
Customers control their relationships with the company.

Service-oriented architecture is a software design methodology related to interorganizational program-to-program communication.

The U.S. Census Bureau defines **merchant companies** as companies that take title to the goods they sell.

Nonmerchant companies **arrange for the purchase and sale of goods**.

Sales between a supplier and a retail consumer are **B2C** transactions.

Jackson Enterprises sells products online to the state-run Environmental Protection Agency. This is a **B2G** transaction.

Amazon.com, REI.com, and LLBean.com are examples of companies that use **B2C** information systems.

In a typical distribution system, raw material suppliers sell to manufacturers, manufacturers sell to distributors, and distributors sell to retailers. All these transactions are categorized as **B2B** transactions.

Traditional B2C information systems rely on a **Web storefront** that customers use to enter and manage their orders.

Which of the following nonmerchant e-commerce companies supports a competitive bidding process?

Auctions

Clearinghouses provide goods and services at a stated price and arrange for the delivery of the goods, but they never take title.

Using e-commerce to buy directly from the manufacturer eliminates the middlemen in the supply chain. Which of the following terms best explains this elimination?

Disintermediation

Price elasticity measures the amount that demand rises or falls with changes in price.

When a business engages in e-commerce, the manufacturer may be able to offer a lower price and still make a profit, which may cause price conflicts with its traditional channel members. The ability of the manufacturer to offer a lower price and still make a profit is largely attributed to **disintermediation**.

When HP Computers began to sell directly to the public, some retailers resented the competition and stopped carrying HP products in their stores. This is an example of **channel conflict**.

Which of the following expenses are likely to increase for manufacturers who use e-commerce to sell directly to consumers?

Customer-service expenses

Web 2.0 companies **provide software as a free service**.

Web 2.0 applications **are downloaded as Silverlight code**.

Traditional software companies rely on **software license fees** for revenue

In the Web 2.0 world, the value of a site increases **with users and use**.

In the Web 2.0 world, no marketing is done. New product features are released and vendors wait for users to spread the news to one another, one friend sending a message to many friends; most of whom send that message, in turn, to their friends; and so forth, in a process called **viral marketing**.

On some sites, users can provide customer support to one another, or even participate in the creation of product specifications, designs, and complete products in a process called **crowdsourcing**.

Traditional sites are about **publishing**; Web 2.0 is about **participation**.

When the output from two or more Web sites is combined into a single user experience it is called a **mashup**.

Google pioneered Web 2.0 advertising. With its **AdWords** software, vendors pay Google a certain amount for particular search words.

A **social network** is a structure of individuals and organizations that are related to each other in some way.

Karl Marx defined **capital** as the investment of resources for future profit.

Which of the following is an example of human capital?

Knowledge and skills

Being linked to a network of highly regarded contacts is a form of social **credential**.

Which of the following is true about social capital?

The people you know the least contribute the most connections to your network.

A **folksonomy** is a content structure that has emerged from the processing of many user tags.

Which of the following are the characteristics of Enterprise 2.0, according to McAfee?

Search, links, authoring, tags, extensions, signals

According to McAfee, Enterprise 2.0 workers want applications that enable them to rate tagged content and to use the tags to predict content that will be of interest to them. This refers to which of the following characteristics of Enterprise 2.0?

Extensions

In Enterprise 2.0, pushing enterprise content to users based on subscriptions and alerts is part of **signaling**, according to McAfee's Enterprise 2.0 model.

Essay Questions

1) What is e-commerce?

E-commerce is the buying and selling of goods and services over public and private computer networks. E-commerce became feasible with the creation and widespread use of HTTP, HTML, and server applications such as Web storefronts that enabled browser-based transactions. E-commerce was not only faster than pre-Internet commerce, it also brought vendors closer to their customers, and in the process changed market characteristics and dynamics.

2) What is Enterprise 2.0?

Enterprise 2.0 is the application of Web 2.0 technologies, collaboration systems, social networking, and related technologies to facilitate the cooperative work of intellectual workers in organizations. Emergence is a key principle of Enterprise 2.0. Neither relationships nor ideas nor projects are predefined. Instead, they emerge as a result of collaboration via social networking.

3) What is meant by service-oriented architecture (SOA)?

Enterprise 2.0 and Social CRM have given a boost to service-oriented architecture (SOA), which is a software design methodology and set of program communication standards that greatly improve the flexibility and adaptability of interorganizational program-to-program communication. SOA standards are meta, metadata. They are standards for defining how interprogram communication metadata are to be created.

4) What is an e-commerce auction? Give an example of an e-commerce company.

E-commerce auctions match buyers and sellers by using an e-commerce version of a standard auction. This e-commerce application enables the auction company to offer goods for sale and to support a competitive-bidding process. The best-known auction company is eBay, but many other auction companies exist; many serve particular industries.

5) What is a clearinghouse? Explain with the help of an example.

Clearinghouses provide goods and services at a stated price and arrange for the delivery of the goods, but they never take title. As a clearinghouse, Amazon.com matches the seller and the buyer and then takes payment from the buyer and transfers the payment to the seller, minus a commission. eBay operates in the same manner. Another type of clearinghouse is an electronic exchange that matches buyers and sellers; the business process is similar to that of a stock exchange. Sellers offer goods at a given price through the electronic exchange, and buyers make offers to purchase over the same exchange. Price matches result in transactions from which the exchange takes a commission.

6) What is disintermediation?

Disintermediation is the elimination of the middle layers within a supply chain. This means that the manufacturer eliminates the distributors, wholesalers, and retailer by selling directly to the consumers. This eliminates inventory-carrying costs, shipping overhead, and handling activity. Because the distributor and associated inventories have become unnecessary waste, disintermediation increases market efficiency.

7) How is e-commerce related to price elasticity?

From the seller's side, e-commerce produces information about price elasticity that has not been available before. Price elasticity measures the amount that demand rises or falls with changes in

price. Using an auction, a company can learn not just what the top price for an item is, but also the second, third, and other prices from the losing bids. In this way, the company can determine the shape of the price elasticity curve. Similarly, e-commerce companies can learn price elasticity directly from experiments on customers.

8) What kind of marketing is used for Web 2.0 applications?

In the Web 2.0 world, new product features are released and vendors wait for users to spread the news to one another, one friend sending a message to many friends; most of whom send that message, in turn, to their friends; and so forth, in a process called viral marketing. Users carry the message to one another. In fact, if a product requires advertising to be successful, then it is not a Web 2.0 product.

9) What are mashups? Explain with the help of an example?

Web 2.0 encourages mashups, which result when the output from two or more Web sites is combined into a single user experience. Google's My Maps is an excellent mashup example. Google publishes Google Maps and provides tools for users to make custom modifications to those maps. Thus, users mash the Google map product with their own knowledge. In Web 2.0 fashion, Google provides users a means for sharing their mashed-up map over the Internet and then indexes that map for Google search.

10) How does social capital add value?

Relationships in social networks can provide information about opportunities, alternatives, problems, and other factors important to business professionals. They also provide an opportunity to influence decision makers in one's employer or in other organizations who are critical to your success. Such influence cuts across formal organizational structures such as reporting relationships. Third, being linked to a network of highly regarded contacts is a form of social credential. Finally, being linked into social networks reinforces a professional's image and position in an organization or industry.

11) How is the value of social capital determined?

The value of social capital is determined by the number of relationships in a social network, by the strength of those relationships, and by the resources controlled by those related.

12) What are the six characteristics of Enterprise 2.0?

McAfee defined six characteristics of Enterprise 2.0, which he refers to by the acronym SLATES acronym. Workers want to be able to *search* for content inside the organization just like they do on the Web. Most workers find that searching is more effective than navigating content structures such as lists and tables of content. Workers want to access organizational content by *link*, just as they do on the Web. They also want to *author* organizational content using blogs, wikis, discussion groups, published presentations, and so forth. Enterprise 2.0 content is *tagged*, just like content on the Web, and tags are organized into structures. Additionally, Enterprise 2.0 workers want applications to enable them to rate tagged content and to use the tags to predict content that will be of interest to them, a process McAfee refers to as *extensions*. Finally, Enterprise 2.0 workers want relevant content pushed to them; they want to be *signaled* when something of interest to them happens in organizational content.

13) What is a folksonomy?

Enterprise 2.0 content is tagged, just like content on the Web, and tags are organized into structures. These structures organize tags as a taxonomy does, but, unlike taxonomies, they are not preplanned; they emerge. A folksonomy is a content structure that has emerged from the processing of many user tags.

14) What is Social CRM?

Social CRM is customer relationship management done in the style of Enterprise 2.0. The relationships between organizations and customers emerge as both parties create and process content. In addition to the traditional forms of promotion, employees in the organization create wikis, blogs, discussion lists, FAQs, sites for user reviews and commentary, and other dynamic content. Customers search this content, contribute reviews and commentary, tag content, ask more questions, create user groups, and so forth. With Social CRM, each customer crafts its own relationship with the company.

15) What is the difference between traditional CRM and Social CRM?

In Social CRM, because relationships emerge from joint activity, customers have as much control as companies. This characteristic is anathema to traditional sales managers who want

control over what the customer is reading, seeing, and hearing about the company and its products. Further, traditional CRM is centered on lifetime value; customers who are likely to generate the most business get the most attention and have the most impact on the organization. But, with Social CRM, the customer who spends 10 cents but who is an effective reviewer, commentator, or blogger can have more influence than the quiet customers who purchase \$10 million a year. Such imbalance is incomprehensible to traditional sales managers.

Chapter 9: Business Intelligence and Information Systems for Decision Making

Notes from Multiple Choice Questions

Business intelligence is information containing patterns, relationships, and trends.

One **kilobyte** is equal to 10^3 bytes.

A type written page is about 2 **kilobytes**.

A petabyte consists of **10^{15}** bytes.

One **exabyte** is equal to 10^{18} bytes

Reporting systems integrate data from multiple sources, and they process that data by sorting, grouping, summing, averaging, and comparing.

Reporting systems improve decision making by **providing the right information to the right user at the right time**.

Decision tree analysis is a technique used by **data-mining** systems.

Data-mining systems improve decision making by using the discovered patterns and relationships to anticipate events or to predict future outcomes.

Market-basket analysis computes the correlation of items on past orders to determine items that are frequently purchased together.

The advantage that **knowledge management systems** have over the other systems is that these foster innovation, improve customer service, increase organizational responsiveness, and reduce costs.

Which of the following systems use If/Then rules?

Expert systems

If Patient_Temperature > 103, Then Initiate High_Fever-Procedure. This sort of a rule is most likely to be found in an **expert** system.

Problematic data are termed as **dirty data**.

WhyMe@GuessWhoIAM.org is an example of **dirty data**.

Which of the following is a problem commonly associated with operational data that have been gathered over time?

Inconsistent

Data granularity refers to the degree of summarization or detail.

Coarse data is highly summarized.

Clickstream data is **too fine**.

Generally, it is better to have data that is **too fine** than data that is **too coarse**.

The more attributes there are, the easier it is to build a model that fits the sample data but that is worthless as a predictor. Which of the following best explains this phenomenon?

The curse of dimensionality

A **data aggregator** is a company that obtains data from public and private sources and stores, combines, and publishes it in sophisticated ways.

The purpose of a **data warehouse** is to extract and clean data from operational systems and other sources, and to store and catalog that data for processing by BI tools.

Which of the following is true for data warehouses?

Data are stored in a data warehouse database using a data warehouse DBMS.

The facts about data, such as its source, format, assumptions, constraints, and the like, are called **metadata**.

A **data mart** is a data collection that is created to address the needs of a particular business

Data warehouses are comparable to distributors in a supply chain because they take data from the data manufacturers, clean and process the data, and locate the data on the disks of its computers.

Data mining is the application of statistical techniques to find patterns and relationships among data and to classify and predict.

Which term is used as a synonym for data mining?

Knowledge discovery in databases

In unsupervised data mining analysts do not create a model or hypothesis before running the analysis.

In **cluster analysis**, statistical techniques identify groups of entities that have similar characteristics.

Cluster analysis is a common unsupervised data-mining technique.

With **supervised** data mining, data miners develop a model prior to the analysis and apply statistical techniques to data to estimate parameters of the model.

Regression analysis is used in **data-mining systems**.

Regression analysis measures the impact of a set of variables on another variable.

Neural networks are a data-mining technique used to predict values and make classifications, such as "good prospect" or "poor prospect" customers.

Essay Questions

1) What is the difference between a megabyte and a gigabyte?

A gigabyte is a bigger than a megabyte. A megabyte is equal to 1,000,000 bytes while a gigabyte equals 1,000,000,000 bytes.

2) What is a business intelligence system?

A business intelligence (BI) system is an information system that provides information for improving decision making. BI systems vary in their characteristics and capabilities and in the way they foster competitive advantage. There are four categories of BI systems: reporting systems, data mining systems, knowledge management systems, and expert systems.

3) Describe the characteristics and advantages of reporting systems.

Reporting systems integrate data from multiple sources, and they process that data by sorting, grouping, summing, averaging, and comparing. Such systems format the results into reports and deliver those reports to users. Reporting systems improve decision making by providing the right information to the right user at the right time.

4) Explain the characteristics and advantages of data mining systems.

Data mining systems process data using sophisticated statistical techniques, such as regression analysis and decision tree analysis. Data mining systems find patterns and relationships that cannot be found by simpler reporting operations, such as sorting, grouping, and averaging. Data mining systems improve decision making by using the discovered patterns and relationships to anticipate events or to predict future outcomes.

Market-basket analysis is a data mining system, which computes correlations of items on past orders to determine items that are frequently purchased together.

5) What are the characteristics and advantages of knowledge management systems?

Knowledge management (KM) systems create value from intellectual capital by collecting and sharing human knowledge of products, product uses, best practices, and other critical knowledge with employees, managers, customers, suppliers, and others who need it. It improves decisions by publishing employee and others' knowledge. This system creates value from existing intellectual capital and fosters innovation, improves customer service, increases organizational responsiveness, and reduces costs.

6) Write a brief note on the characteristics and advantages of expert system.

Expert systems encapsulate the knowledge of human experts in the form of *If/Then* rules and process those rules to make a diagnosis or recommendation. These systems improve decision making by nonexperts by encoding, saving, and processing expert knowledge. Although few expert systems have demonstrated a capability equivalent to a human expert, some are good enough to considerably improve the diagnosis and decision making of nonexperts.

7) What is dirty data?

Data from transaction processing and other operational systems can be processed to create basic reports without problem. However, raw operational data is seldom suitable for more sophisticated reporting or data mining. First, although data that are critical for successful operations must be complete and accurate, data that are only marginally necessary do not need to be. For example, some systems gather demographic data in the ordering process. But because such data are not needed to fill, ship, and bill orders, their quality suffers. Such problematic data is known as dirty data.

Examples of dirty data are values of B for customer gender and of 213 for customer age. Other examples are a value of 999-999-9999 for a U.S. phone number, a part color of green, and an email address of WhyMe@GuessWhoIAM.org. All of these values can be problematic for data mining purposes.

8) What is data granularity?

Data can be too fine or too coarse. Data granularity refers to the degree of summarization or detail. Coarse data are highly summarized; fine data express precise details. Generally, it is better to have too fine a granularity than too coarse. If the granularity is too fine, the data can be made coarser by summing and combining. If the granularity is too coarse, however, there is no way to separate the data into constituent parts.

9) Explain clickstream data.

Clickstream data is that data which is captured from customers' clicking behavior. These data are very fine and include everything a customer does at the Web site. Because the data are too fine, the data analysts must throw away millions and millions of clicks.

10) Explain the curse of dimensionality.

The curse of dimensionality is associated with the problem of data having too many attributes. Suppose there are too many attributes from the internal customer data as well as the customer data that has been purchased. To be able to select among them, the curse of dimensionality says that the more attributes there are, the easier it is to build a model that fits the sample data but that is worthless as a predictor.

11) What is the purpose of a data warehouse?

The purpose of a data warehouse is to extract and clean data from operational systems and other sources, and to store and catalog that data for processing by BI tools. The prepared data are stored in a data warehouse database using a data warehouse DBMS, which can be different from the organization's operational DBMS.

12) How is a data warehouse different from a data mart?

The purpose of a data warehouse is to extract and clean data from operational systems and other sources, and to store and catalog that data for processing by BI tools. In a way, one can think of a data warehouse as a distributor in a supply chain. The data warehouse takes data from the data manufacturers (operational systems, other internal systems, etc.), cleans and processes the data, and locates the data on its shelves, so to speak—that is, on the disks of the data warehouse computers. The people who work with a data warehouse are experts at data management, data cleaning, data transformation, metadata design, and the like. Data warehouse business analysts know the general needs of the business, but they are not experts in a given business function.

A data mart is a data collection, smaller than the data warehouse, that addresses a particular component or functional area of the business. If the data warehouse is the distributor in a supply chain, then a data mart is like a retail store in a supply chain. Users in the data mart obtain data that pertain to a particular business function from the data warehouse. Such users do not have the data management expertise that data warehouse employees have, but they are knowledgeable analysts for a given business function.

13) What is data mining?

Data mining is the application of statistical techniques to find patterns and relationships among data and to classify and predict. Data mining techniques emerged from statistics and mathematics and from artificial intelligence and machine-learning fields in computer science. As a result, data

mining terminology is an odd blend of terms from these different disciplines. Sometimes people use the term knowledge discovery in databases (KDD) as a synonym for data mining. Most data mining techniques are sophisticated, and many are difficult to use. Data mining techniques fall into two broad categories: unsupervised and supervised.

14) What is unsupervised data mining?

Unsupervised data mining is where analysts do not create a model or hypothesis before running the analysis. Instead, they apply the data mining technique to the data and observe the results. With this method, analysts create hypotheses after the analysis to explain the patterns found. Findings are obtained solely by data analysis.

One common unsupervised technique is cluster analysis. With it, statistical techniques identify groups of entities that have similar characteristics. A common use for cluster analysis is to find groups of similar customers from customer order and demographic data.

15) Explain supervised data-mining and list the techniques used in it.

With supervised data mining, data miners develop a model prior to the analysis and apply statistical techniques to data to estimate parameters of the model. For example, suppose marketing experts in a communications company believe that cell phone usage on weekends is determined by the age of the customer and the number of months the customer has had the cell phone account. A data-mining analyst would then run an analysis that estimates the impact of customer and account age.

One technique that measures the impact of a set of variables on another variable is called a regression analysis. Neural networks are another popular supervised data mining technique used to predict values and make classifications, such as “good prospect” or “poor prospect” customers.

Chapter 10: Information Systems Development

Notes from Multiple Choice Questions

The process of creating and maintaining information systems is called **systems development**.

Compared to program development, systems development is **broader in scope**.

Systems development requires coordinated teamwork of both specialists and nonspecialists with business knowledge.

Information systems are never **off-the-shelf**.

The bigger the system and the longer the project, **the more the requirements change**.

According to Brooks' Law, adding more people to a late project **makes the project later**.

Adding more people to a late systems development project will make the project later because **training new people slows down team members**.

As development teams become larger, the average contribution per worker **decreases**.

As staff size increases, **more** meetings and coordination activities are required to keep everyone in sync.

Developers in the **system definition** phase of the SDLC use management's statement of the system needs, in order to begin the process of developing a new information system.

The **systems development life cycle (SDLC)** approach is the classical process used to develop information systems.

The initial step in the first phase of the SDLC is to **define the goals and scope of the new system**.

The step in the SDLC process that aims to eliminate obviously nonsensible projects is **Assess project feasibility**.

Organizational feasibility concerns whether the new information system fits within a company's customs, culture, charter, or legal requirements.

Systems analysts are IT professionals who understand both business and technology.

Which of the following statements is true regarding the composition of the development team over the life of the SDLC?

During requirements definition, the team will be heavy with systems analysts.

The primary purpose of the requirements analysis phase is to **determine and document the specific features and functions of the new system**.

Determining the system's requirements is the most important phase in the systems development process.

During the requirements analysis phase of the SDLC, the development team will create a **data model** in case the new system involves a new database or substantial changes to an existing database.

Requirements include what is to be produced, as well as how frequently and how fast it is to be produced.

The easiest and cheapest time to alter the information system is in the **requirements analysis** phase of the SDLC.

In terms of software design, for **off-the-shelf software**, the team must determine candidate products and evaluate them against the requirements while for **custom-developed programs**, the team produces design documentation for writing program code.

Normal processing procedures for system users are procedures for using the system to accomplish business tasks.

Normal processing procedures for operations personnel are procedures for starting, stopping, and

running the system.

During the **implementation** phase of the SDLC process, developers construct, test, and install the components of the information system.

A **test plan** should cause every line of program code to be executed.

Beta testing is the process of allowing future system users to try out the new system on their own.

Products in the beta test phase **are generally fully functioning**.

Users have the final say on whether a system is ready.

System conversion refers to the process of moving the business activity from an old information system to a new system.

The advantage of **pilot** installation is that if the system fails, the failure is contained within a limited boundary.

In a **parallel** installation, the new system runs alongside the old one until it has been tested and is fully operational.

Parallel installation is the **slowest** style of installation.

Because of the significant risks involved, organizations should avoid the **plunge** conversion style if possible.

Which of the following statements is true with regard to system maintenance?

All commercial software products are shipped with known failures.

Software developers group fixes for high priority failures into a **patch** that can be applied to all copies of a given product.

Software vendors usually bundle fixes of low-priority problems into **service packs**.

One of the reasons for SDLC problems is due to the **waterfall** nature of the SDLC. This implies

that the systems development process is supposed to operate in a sequence of nonrepetitive phases.

Projects that spend so much time **documenting requirements** are sometimes said to be in analysis paralysis.

Essay Questions

1) What is systems development? How is it different from program development?

Systems development is the process of creating and maintaining information systems. Systems development has a broader scope than computer program development as it involves all five components: hardware, software, data, procedures, and people. Developing a computer program, on the other hand, mostly involves software programs, with some focus on data and databases. Compared to program development, systems development requires more than just programming or technical expertise. Establishing the system's goals, setting up the project, and determining requirements require business knowledge and management skill. Tasks like building computer networks and writing computer programs require technical skills. Creating data models requires the ability to interview users and understand their view of the business activities. Designing procedures, especially those involving group action, requires business knowledge and an understanding of group dynamics. Developing job descriptions, staffing, and training all require human resource and related expertise.

Thus, unlike program development, systems development is not an exclusively technical task undertaken by programmers and hardware specialists. Rather, it requires coordinated teamwork of both specialists and nonspecialists with business knowledge.

2) Why is systems development difficult and risky?

Systems development is difficult and risky because it is often very difficult to determine system requirements, which is further compounded by the fact that requirements tend to change as the system is developed. Usually, the bigger the system and the longer the project, the more the requirements change. Systems development also faces difficulties in terms of scheduling and budgeting. It is often difficult to estimate the time it will take to build a system and if labor hours cannot be estimated, labor costs cannot be estimated. Yet another challenge is that while the project is underway, technology continues to change. Lastly, as development teams become larger, the average contribution per worker decreases. This is true because as staff size increases,

more meetings and other coordinating activities are required to keep everyone in sync. There are economies of scale up to a point, but beyond a workgroup of, say, 20 employees, diseconomies of scale begin to take over.

3) Explain how diseconomies of scale can affect systems development.

Unfortunately, as development teams become larger, the average contribution per worker decreases. This is true because as staff size increases, more meetings and other coordinating activities are required to keep everyone in sync. There are economies of scale up to a point, but beyond a workgroup of, say, 20 employees, diseconomies of scale begin to take over.

Brooks' Law points out a related problem: Adding more people to a late project makes the project later. Brooks' Law is true not only because a larger staff requires increased coordination, but also because new people need training. The only people who can train the new employees are the existing team members, who are thus taken off productive tasks. The costs of training new people can overwhelm the benefit of their contribution.

4) What are the phases of the systems development life cycle (SDLC)?

The five phases of the systems development life cycle are (1) system definition, (2) requirements analysis, (3) component design, (4) implementation, and (5) system maintenance.

5) What are the main tasks that are performed during the system definition phase of the SDLC?

During the system definition phase of the SDLC, the development team defines the goal and purpose of the new system. The project's scope is defined by specifying the users or the business processes or the plants, offices, and factories that will be involved. The next step is to assess feasibility. This step answers the question, "Does this project make sense?" The aim here is to eliminate obviously nonsensible projects before forming a project development team and investing significant labor. Feasibility is assessed in terms of four dimensions: cost, schedule, technical, and organizational. If the defined project is determined to be feasible, the next step is to form the project team. Typical personnel on a development team are a manager, system analysts, programmers, software testers, and users. The first major task for the assembled project team is to plan the project. Members of the project team specify tasks to be accomplished, assign personnel, determine task dependencies, and set schedules.

6) Typically, who are part of a systems project team? What are the roles of business analysts and systems analysts?

Typical personnel on a development team are a manager (or managers for larger projects), business analysts, system analysts, programmers, software testers, and users. Business analysts specialize in understanding business needs, strategies, and goals and helping businesses implement systems to accomplish their competitive strategies. Systems analysts are IT professionals who understand both business and technology.

Systems analysts are closer to IT and are a bit more technical, though there is considerable overlap in the duties and responsibilities of business and system analysts. Both are active throughout the systems development process and play a key role in moving the project through the systems development process. Business analysts work more with managers and executives; systems analysts integrate the work of the programmers, testers, and users. Depending on the nature of the project, the team may also include hardware and communications specialists, database designers and administrators, and other IT specialists.

7) What is meant by technical feasibility and organizational feasibility?

Technical feasibility refers to whether existing information technology is likely to be able to meet the needs of the new system. Organizational feasibility concerns whether the new system fits within the organization's customs, culture, charter, or legal requirements.

8) What is the importance of the requirements analysis phase of the SDLC?

Determining the system's requirements is the most important phase in the systems development process. If the requirements are wrong, the system will be wrong. If the requirements are determined completely and correctly, then design and implementation will be easier and more likely to result in success. Sources of requirements include system users and existing systems. The Web pages, forms, reports, queries, and application features and functions desired in the new system are also determined. Security is another important category of requirements. The easiest and cheapest time to alter the information system is in the requirements phase. Changing a requirement at this stage is simply a matter of changing a description. Changing a requirement in the implementation phase may require weeks of reworking applications components and the database.

9) How is software designed?

Software design depends on the source of the programs. For off-the-shelf software, the team must determine candidate products and evaluate them against the requirements. For off-the-shelf-with-alteration software, the team identifies products to be acquired off-the-shelf and then determines the alterations required. For custom-developed programs, the team produces design documentation for writing program code.

10) What is a test plan?

Once developers have constructed and tested all of the system components, they integrate the individual components and test the system. Software and system testing are difficult, time-consuming, and complex tasks. Developers need to design and develop test plans and record the results of tests. A test plan consists of sequences of actions that users will take when using the new system. Test plans include not only the normal actions that users will take, but also incorrect actions. A comprehensive test plan should cause every line of program code to be executed. The test plan should cause every error message to be displayed.

11) What is beta testing?

Beta testing is the process of allowing future system users to try out the new system on their own. Software vendors, such as Microsoft, often release beta versions of their products for users to try and to test. Such users report problems back to the vendor. Beta testing is the last stage of testing. Normally, products in the beta test phase are complete and fully functioning; they typically have few serious errors.

12) What are the four ways in which organizations can implement a system conversion?

Organizations can implement a system conversion in one of four ways. In a pilot installation, the organization implements the entire system on a limited portion of the business. In a phased installation, the new system is installed in phases across the organization. With parallel installation, the new system runs in parallel with the old one until the new system is tested and fully operational. The final style of conversion is plunge installation (sometimes called direct installation). With it, the organization shuts off the old system and starts the new system.

13) What are the tasks of system maintenance?

The last phase of the SDLC is maintenance. Maintenance is a misnomer; the work done during this phase is either to fix the system so that it works correctly or to adapt it to changes in requirements. First, there needs to be a means for tracking both failures and requests for enhancements to meet new requirements. For small systems, organizations can track failures and enhancements using word-processing documents. Typically, IS personnel prioritize system problems according to their severity. They fix high-priority items as soon as possible, and they fix low-priority items as time and resources become available.

14) What are patches and service packs?

Patches are group fixes for high priority failures that can be applied to all copies of a given product. Software vendors supply patches to fix security and other critical problems. They usually bundle fixes of low-priority problems into larger groups called service packs. Users apply service packs in much the same way that they apply patches, except that service packs typically involve fixes to hundreds or thousands of problems.

15) What are the problems associated with the SDLC waterfall? Explain with an example.

Although the industry has experienced notable successes with the SDLC process, there have also been many problems with it. One of the reasons for SDLC problems is due to the waterfall nature of the SDLC. Like a series of waterfalls, the process is supposed to operate in a sequence of nonrepetitive phases. For example, the team completes the requirements phase and goes over the waterfall into the design phase, and on through the process. Most commonly, when design work begins and the team evaluates alternatives, they learn that some requirements statements are incomplete or missing. At that point, the team needs to do more requirements work, yet that phase is supposedly finished.

Chapter 11: Information Systems Management

Notes from Multiple Choice Questions

The three principal reasons why employees need to know about the IS department:

- To be a better informed and effective manager or executive
- To be an effective consumer of the IT department's resources
- To ensure that the functions of the IT department are performed

Regarding the IT department's responsibility of planning for information systems (IS) and IT infrastructure, all projects involving IS are a part of a business system or facilitate some business goal.

Microsoft coined the term “agile enterprise”.

An organization that can quickly adapt to changes in the market, industry, product, law, or other significant external factors is referred to as an **agile enterprise**.

After planning for information systems and IT infrastructure, the next step is **creating, developing, and adapting both information systems and IT infrastructure**.

Email systems, VPNs, company blogs, and SharePoint sites are IS-based infrastructure.

When there are significant changes in an organization's workload, networks and servers should be **tuned to** these changes.

One of the sources of threats to IT infrastructure is malicious human activity.

CIO is another, more common title given to the vice president of information systems.

Other titles for the **CIO** include director of information services and director of computer services.

The IT department's principal manager is the **CIO**.

In organizations where primary information systems support accounting and finance activities, a reporting arrangement wherein the CIO reports to the **CFO** is practical.

In organizations that operate significant nonaccounting information systems, such as manufacturers, a reporting arrangement wherein the CIO reports to the **CEO** is more common and effective.

An organization that wishes to leverage the power of social networking to help accomplish its goals and objectives should ideally turn to the **technology** group within its IT department for information.

The CTO heads the **technology** group in the IS department.

A **technology office** investigates new information systems technologies and determines how the organization can benefit from them.

In an IS department, the **development group** manages the process of creating new information systems.

An important function for the **operations group** is to monitor user experience and respond to user problems.

The **development** group within the IT department manages the process of creating new information systems as well as maintaining existing information systems.

If a company's IS-related programs are not developed in-house, then the development group within its IT department will be staffed primarily by **systems analysts**.

The development group in a company's IT department is staffed primarily by programmers, test engineers, technical writers, and other development personnel. Based on this information, **the company develops programs in-house**.

In the context of information systems, **maintenance** means either removing problems or adapting existing information systems to support new features and functions.

The **data administration** group protects data and information assets by establishing data

standards and data management practices and policies.

Data administration staff establishes data standards and data management practices and policies.

Benefits for which the dollar values can be computed are **tangible benefits**.

Intangible benefits are those for which it is impossible to compute a dollar value.

Responsibilities of a **system analyst**:

- Works with users to determine system requirements
- Designs and develops job descriptions and procedures
- Helps determine system test plans

A **PQA test engineer** develops test plans, designs and writes automated test scripts, and performs testing.

A **network administrator** monitors, maintains, fixes, and tunes computer networks.

A **consultant** performs a wide range of activities such as programming, testing, database design, communications and networks, project management, and so on, and is required to have an entrepreneurial attitude.

Responsibilities of a **small-scale project manager**: initiate, plan, manage, monitor, and close down projects.

As a **user of IS**, you have a right to contribute to requirements for new system features and functions.

Effective training is an IS user's right.

Installation of authorized programs is an IS user's responsibility?

As a user of IS, you have a responsibility to **avoid reporting trivial problems**.

As a user of IS, an employee has a responsibility to avoid **unauthorized hardware modifications**.

Essay Questions

1) Why does one need to know about the IT department?

One needs to know about the IT department for three principal reasons. First, one needs to understand the responsibilities and duties of the IT department in order to be an effective consumer of the IT department's resources. If you understand what the IT department does and how it is organized, you'll know how better to obtain the equipment, services, or systems you need. Second, you need to know about the functions of the IT department to be a better informed and effective manager or executive. Finally, if you are a manager, you need to ensure that the functions of the IT department are performed.

2) Describe the IS department's responsibility to plan for information systems and IT infrastructure.

Information systems exist to further the organization's competitive strategy. They exist to facilitate business processes and to help improve decision making. Thus, there are no "IS projects"; instead, all projects involving IS are a part of some other business system or facilitate some business goal.

The IS department has the responsibility of aligning all of its activities with the organization's primary goals and objectives. As new technology emerges, the IS department is responsible for assessing that technology and determining if it can be used to advance the organization's goals. Furthermore, as the business changes, the IS department is responsible for adapting infrastructure and systems to the new business goals.

3) Who coined the term 'agile enterprise' and what did they mean by it?

Today, many executives use the term 'agile enterprise' to refer to an organization that can quickly adapt to changes in the market, industry, product, law, or other significant external factors. Microsoft used this term many years ago because IT infrastructure and systems are known to be particularly difficult to adapt to change, and it claimed its products would change this characteristic. This might be the case, but the one certain effect of its campaign was to alert IS managers and business executives to the need to be adaptable.

4) Explain the IS department's responsibility to develop and adapt information systems

and IT infrastructure.

Given a plan, the next task for the IS department is to create, develop, and adapt both information systems and IT infrastructure. The IS department is responsible for creating and adapting IT infrastructure, such as computer networks, servers, data centers, data warehouses, data marts, and other IS resources. The IS department is also charged with creating systems infrastructures, such as email systems, VPNs, company blogs, SharePoint sites, and other IS-based infrastructure the company needs.

In most organizations, user departments pay for computers and related equipment out of their own budgets. However, because the IS department is responsible for maintaining that equipment and for connecting it to the organizational networks, the IS department will specify standard computer systems and configurations that it will support. The IS department is responsible for defining those specifications.

5) How does the IS department protect infrastructure and data?

The IS department is responsible for protecting infrastructure and data from threats. Threats to IT infrastructure and data arise from three sources: human error and mistakes, malicious human activity, and natural events and disasters.

The IS department helps the organization manage risk. The department needs to identify potential threats, estimate both financial and other risks, and specify appropriate safeguards. Nothing is free, including safeguards, and, indeed, some safeguards are very expensive. The IS department works with the CFO and others in the organization to determine what safeguards to implement, or stated differently, what level of risk to assume.

6) Compare the role of the chief information officer (CIO) and the role of the chief technology officer (CTO).

Chief information officer (CIO) is generally the title of the principal manager of an organization's IT department. Like other senior executives, the CIO reports to the chief executive officer, although sometimes these executives report to the chief operating officer, who in turn reports to the CEO. In some companies, the CIO reports to the chief financial officer. The CIO has the responsibility of managing the IT department, communicating with executive staff on IT- and IS-related matters. The CIO is also a member of the executive group.

The chief technology officer (CTO) often heads the technology group within the IT department. The CTO sorts through new ideas and products to identify those that are most relevant to the organization. The CTO's job requires deep knowledge of information technology and the ability to envision how new IT will affect the organization over time. The CTO's responsibility is to advise the CIO, executive group, and project managers on emerging technologies.

7) What is the typical structure of an organization's IT department?

A typical IT department consists of four groups—a technology office that investigates new information systems technologies and determines how an organization can benefit from them; an operations group that manages the computing infrastructure, including individual computers, computer centers, networks, and communications media; a development group that manages the process of creating new information systems as well as maintaining existing information systems; and an outsourcing relations group in organizations that have negotiated outsourcing agreements with other companies to provide equipment, applications, or other services. The data administration staff function protects data and information assets by establishing data standards and data management practices and policies.

However, there are many variations in the structure of the IT department. In larger organizations, the operations group may itself consist of several different departments. Sometimes, there is a separate group for data warehousing and data marts.

8) What is the responsibility of the technology office of a firm's IS department?

Most IS departments include a technology office that investigates new information systems technologies and determines how the organization can benefit from them. For example, today many organizations are investigating cloud computing, virtualization, SOA, social networking, and user-generated content and planning on how they can best use those technologies to accomplish their goals and objectives. An individual called the chief technology officer (CTO) often heads the technology group. The CTO sorts through new ideas and products to identify those that are most relevant to the organization. The CTO's job requires deep knowledge of information technology and the ability to envision how new IS will affect the organization over time.

9) Describe the development group of a firm's IS department.

The development group of an IT department manages the process of creating new information systems as well as maintaining existing information systems. The size and structure of the development group depends on whether programs are developed in-house. If not, this department will be staffed primarily by systems analysts who work with users, operations, and vendors to acquire and install licensed software and to set up the system components around that software. If the organization develops programs in-house, then this department will include programmers, test engineers, technical writers, and other development personnel.

10) What are tangible and intangible benefits?

Most IS and IT investment analyses divide benefits into two categories: tangible and intangible. Tangible benefits are those for which a dollar value can be computed. Reducing customer support costs by 10 percent is a tangible benefit. Intangible benefits are those for which it is impossible to compute a dollar value. The benefits of the email system are intangible.

11) How can one justify IS and IT projects?

One common method for justifying IS and IT projects is to compute the costs and tangible benefits of the system and to perform a financial analysis. If the project can be justified on tangible benefits alone, then the favorable decision is made. If it cannot be justified on the basis of tangible benefits, then the intangible benefits are considered, and a subjective decision is made as to whether the intangibles are sufficiently valuable to overcome the missing tangible benefits that would be required.

12) Describe the responsibilities of a system analyst, a computer technician, and a network administrator.

A system analyst works with users to determine system requirements, designs and develops job descriptions and procedures, and helps determine system test plans. A computer technician installs software and repairs computer equipment and networks. A network administrator monitors, maintains, fixes, and tunes computer networks.

13) What are a user's rights in relation to the IT department?

In relation to the IT department, users have a right to computer hardware and programs that

allow them to perform their jobs proficiently, to reliable network and Internet connections, to a secure computing environment, to protection from viruses, worms, and other threats, and a right to contribute to requirements for new system features and functions. Users also have a right to reliable systems development and maintenance, to prompt attention to problems, concerns, and complaints, to properly prioritized problem fixes and resolutions, and effective training to use systems to perform their jobs.

14) What are a user's responsibilities in relation to the IT department?

In relation to the IT department, users have a responsibility to learn basic computer skills and the standard techniques and procedures for the applications they use, to follow security and backup procedures, to protect their password(s), to use computer resources according to their employer's computer-use policy, to make no unauthorized hardware modifications, to install only authorized programs, to apply software patches and fixes when directed to do so. When asked, they must devote the time required to respond carefully and completely to requests for requirements for new system features and functions. They mustn't resort to reporting trivial problems.

15) Why is the responsibility to install patches important?

The responsibility to install patches is particularly important for patches that concern security and backup and recovery. When asked for input to requirements for new and adapted systems, one has a responsibility to take the time necessary to provide thoughtful and complete responses. If one does not have that time, one should delegate that input to someone else.

Chapter 12: Information Security Management

Notes from Multiple Choice Questions

An employee who intentionally destroys data or other system components is an example of a security threat resulting from **malicious human activity**.

A person calls the Draper residence and pretends to represent a credit card company. He asks Mrs. Draper to confirm her credit card number. This is an example of **pretexting**.

E-mail spoofing is a synonym for phishing.

Drive-by sniffers simply take computers with wireless connections through an area and search for unprotected wireless networks.

An employee carelessly releases proprietary data to the media. This is a case of **unauthorized data disclosure** resulting from **human error**.

A **phisher** pretends to be a legitimate company and sends emails requesting confidential data.

Mark recently received an email from what appeared to be a legitimate company, asking him to update and verify his credit card details. Unknowingly, he obliged and later realized that the information had been misused. Mark is a victim of **phishing**.

Sniffing is a technique for intercepting computer communications.

DOS attacks occur when bogus services flood a Web server.

Some unauthorized programs are able to **usurp** legitimate systems and substitute their own processing.

Hacking occurs when a person gains unauthorized access to a computer system.

A problem in a customer billing system that occurs due to errors made during software

installation is a case of **faulty service** resulting from **human error**.

Backup and recovery is an example of a data safeguard against security threats.

Procedure design is a human safeguard against security threats.

Identification and authorization is a technical safeguard against security threats.

A user name **identifies** a user.

A password **authenticates** a user.

Users of smart cards are required to enter a **PIN** to be authenticated.

A **smart** card has a microchip on it that is loaded with identifying data.

Biometric authentication uses personal physical characteristics such as fingerprints, facial features, and retinal scans to verify users.

Encryption is the process of transforming clear text into coded, unintelligible text for secure storage or communication.

Steps of the **Secure Socket Layer** include:

- The computer obtains the public key of the website to which it will connect.
- The computer generates a key for symmetric encryption.
- The computer encodes that key using the Web site's public key.

A **perimeter firewall** sits outside the organizational network and is the first device that Internet traffic encounters.

Packet-filtering firewalls can prohibit outsiders from starting a session with any user behind the firewall.

The program code that causes unwanted activity is called the **payload**.

The broadest definition of **malware** includes viruses, worms, Trojan horses, spyware, and adware.

Trojan horses are malware masquerading as useful programs?

The similarity between adware and spyware is that **both are installed without user's permission.**

Malware definitions are the patterns that exist in malware code and should be downloaded and updated frequently.

Organizations should protect sensitive data by storing it in **encrypted** form.

Because encryption keys can get lost or destroyed, a copy of the key should be stored with a trusted third party. This safety procedure is sometimes called **key escrow.**

Physical security is an example of a data safeguard.

Position sensitivity enables security personnel to prioritize their activities in accordance with the possible risk and loss.

Enforcement of security procedures and policies consists of three interdependent factors: **responsibility, accountability, and compliance.**

In terms of password management, when an account is created, users should **immediately change the password they are given to a password of their own.**

Typically, a help-desk information system has answers to questions that only a true user would know, such as the user's birthplace, mother's maiden name, or last four digits of an important account number. This information **helps authenticate a user.**

Activity log analysis is an important **security monitoring** function.

Hot sites are remote processing centers run by commercial disaster-recovery services.

Every organization should have an **incident-response plan** as part of the security program, which should include how employees are to react to security problems, whom they should contact, the reports they should make, and steps they can take to reduce further loss.

The **incident-response plan** should identify critical personnel and their off-hours contact information.

Essay Questions

1) Distinguish between phishing, spoofing, and sniffing.

Phishing is a technique for obtaining unauthorized data that uses pretexting via email. The phisher pretends to be a legitimate company and sends an email requesting confidential data, such as account numbers, Social Security numbers, account passwords, and so forth.

Spoofing is another term for someone pretending to be someone else. IP spoofing occurs when an intruder uses another site's IP address as if it were that other site. Email spoofing is a synonym for phishing.

Sniffing is a technique for intercepting computer communications. With wired networks, sniffing requires a physical connection to the network. With wireless networks, no such connection is required. Drive-by sniffers simply take computers with wireless connections through an area and search for unprotected wireless networks.

2) Explain denial of service (DOS) in information management.

Human error in following procedures or a lack of procedures can result in denial of service (DOS). For example, humans can inadvertently shut down a Web server or corporate gateway router by starting a computationally intensive application. An OLAP application that uses the operational DBMS can consume so many DBMS resources that order-entry transactions cannot get through. Denial-of-service attacks can be launched maliciously. A malicious hacker can flood a Web server, for example, with millions of bogus service requests that so occupy the server that it cannot service legitimate requests. Computer worms can infiltrate a network with so much artificial traffic that legitimate traffic cannot get through. Finally, natural disasters may cause systems to fail, resulting in denial of service.

3) Discuss in brief the pros and cons of biometric authentication.

Biometric authentication uses personal physical characteristics such as fingerprints, facial features, and retinal scans to authenticate users. Biometric authentication provides strong authentication, but the required equipment is expensive. Often, too, users resist biometric identification because they feel it is invasive. Biometric authentication is in the early stages of

adoption. Because of its strength, it likely will see increased usage in the future. It is also likely that legislators will pass laws governing the use, storage, and protection requirements for biometric data.

4) Differentiate between symmetric and asymmetric encryption.

To encode a message, a computer program uses the encryption method with the key to convert a noncoded message into a coded message. The resulting coded message looks like gibberish. Decoding (decrypting) a message is similar; a key is applied to the coded message to recover the original text. With symmetric encryption, the same key (again, a number) is used to encode and to decode. With asymmetric encryption, two keys are used; one key encodes the message, and the other key decodes the message. Symmetric encryption is simpler and much faster than asymmetric encryption. A special version of asymmetric encryption, public key/private key, is used on the Internet.

5) What are firewalls? What types of firewalls are commonly used?

A firewall is a computing device that prevents unauthorized network access. A firewall can be a special-purpose computer or it can be a program on a general-purpose computer or on a router. Organizations normally use multiple firewalls. A perimeter firewall sits outside the organizational network; it is the first device that Internet traffic encounters. In addition to perimeter firewalls, some organizations employ internal firewalls inside the organizational network. A packet-filtering firewall examines each part of a message and determines whether to let that part pass. To make this decision, it examines the source address, the destination address(es), and other data. Packet-filtering firewalls can prohibit outsiders from starting a session with any user behind the firewall.

6) How is a Trojan horse different from a worm?

There are many different types of viruses. Trojan horses are viruses that masquerade as useful programs or files. A typical Trojan horse appears to be a computer game, an MP3 music file, or some other useful, innocuous program. A worm is a virus that propagates using the Internet or other computer network. Worms spread faster than other virus types because they are specifically programmed to spread. Unlike nonworm viruses, which must wait for the user to share a file with a second computer, worms actively use the network to spread. Sometimes, worms so choke a network that it becomes unusable.

7) What is the difference between adware and spyware?

Spyware programs are installed on the user's computer without the user's knowledge or permission. Spyware resides in the background and, unknown to the user, observes the user's actions and keystrokes, monitors computer activity, and reports the user's activities to sponsoring organizations. Some malicious spyware captures keystrokes to obtain user names, passwords, account numbers, and other sensitive information. Other spyware supports marketing analyses, observing what users do, Web sites visited, products examined and purchased, and so forth. Adware is similar to spyware in that it is installed without the user's permission and it also resides in the background and observes user behavior. Most adware is benign in that it does not perform malicious acts or steal data. It does, however, watch user activity and produce pop-up ads. Adware can also change the user's default window or modify search results and switch the user's search engine.

8) List some important malware safeguards.

It is possible to avoid most malware using the following malware safeguards: (1) install antivirus and antispyware programs on your computer, (2) set up the anti-malware programs to scan your computer frequently, (3) update malware definitions, (4) open email attachments only from known sources, (5) promptly install software updates from legitimate sources, and (6) browse only in reputable Internet neighborhoods.

9) How can data safeguards protect against security threats?

Data safeguards protect databases and other organizational data. Both data and database administration are involved in establishing the data safeguards. First, data administration should define data policies. Then, data administration and database administration(s) work together to specify user data rights and responsibilities. Third, those rights should be enforced by user accounts that are authenticated at least by passwords. The organization should protect sensitive data by storing it in encrypted form. It is important to periodically create backup copies of database contents. Physical security is another data safeguard.

10) Explain how defining positions in an organization can safeguard against security threats.

Effective human safeguards begin with definitions of job tasks and responsibilities. In general, job descriptions should provide a separation of duties and authorities. For example, no single individual should be allowed both to approve expenses and write checks. Instead, one person should approve expenses, another pay them, and a third should account for the payment. Similarly, in inventory, no single person should be allowed to authorize an inventory withdrawal and also to remove the items from inventory. Given appropriate job descriptions, user accounts should be defined to give users the least possible privilege needed to perform their jobs. For example, users whose job description does not include modifying data should be given accounts with read-only privilege. Similarly, user accounts should prohibit users from accessing data their job description does not require. Because of the problem of semantic security, even access to seemingly innocuous data may need to be limited. Finally, the security sensitivity should be documented for each position. Some jobs involve highly sensitive data (e.g., employee compensation, salesperson quotas, and proprietary marketing or technical data). Other positions involve no sensitive data. Documenting position sensitivity enables security personnel to prioritize their activities in accordance with the possible risk and loss.

11) What are the three interdependent factors involved in the enforcement of security policies and procedures?

Enforcement consists of three interdependent factors: responsibility, accountability, and compliance. First, the company should clearly define the security responsibilities of each position. The design of the security program should be such that employees can be held accountable for security violations. Procedures should exist so that when critical data are lost, it is possible to determine how the loss occurred and who is accountable. Finally, the security program should encourage security compliance. Employee activities should regularly be monitored for compliance, and management should specify disciplinary action to be taken in light of noncompliance.

12) Explain account management.

Account management concerns the creation of new user accounts, the modification of existing account permissions, and the removal of unneeded accounts. Information system administrators perform all of these tasks, but account users have the responsibility to notify the administrators of the need for these actions. The IT department should create standard procedures for this purpose. The existence of accounts that are no longer necessary is a serious security threat. Information system administrators cannot know when an account should be removed; it is up to

users and managers to give such notification.

13) What is the difference between a hot site and a cold site?

Both hot sites and cold sites are backup processing centers. Hot sites are remote processing centers run by commercial disaster-recovery services. For a monthly fee, they provide all the equipment needed to continue operations following a disaster. Cold sites, in contrast, provide office space, but customers themselves provide and install the equipment needed to continue operations.

14) Describe an incident-response plan.

Every organization should have an incident-response plan as part of the security program. The plan should include how employees are to respond to security problems, whom they should contact, the reports they should make, and steps they can take to reduce further loss.

The plan should provide centralized reporting of all security incidents that will enable an organization to determine if it is under systematic attack or whether an incident is isolated. Centralized reporting also allows the organization to learn about security threats, take consistent actions in response, and apply specialized expertise to all security problems. Viruses and worms can spread very quickly across an organization's networks, and a fast response will help to mitigate the consequences. Because of the need for speed, preparation pays. The incident-response plan should identify critical personnel and their off-hours contact information. These personnel should be trained on where to go and what to do when they get there. Finally, organizations should periodically practice incident response.

15) What should an organization do when a security breach occurs in its information systems?

When an incident does occur, speed is of the essence. Viruses and worms can spread very quickly across an organization's networks, and a fast response will help to mitigate the consequences. Because of the need for speed, preparation pays. The incident-response plan should identify critical personnel and their off-hours contact information. These personnel should be trained on where to go and what to do when they get there. Without adequate preparation, there is substantial risk that the actions of well-meaning people will make the problem worse. Organizations should periodically practice incident response. Without such practice, personnel will be poorly informed on the response plan, and the plan itself may have flaws that only

become apparent during a drill.

MODULE 1 NOTES: MIS AND YOU

What is an Information System?

- System: group of components that interact to achieve some purpose
- Information system (IS): group of components that interact to produce information
- Not all info systems require computerization
 - Public library is an IS
 - Smartphone, databases, etc
- Customer Relationship Management (CRM): uses algorithms and databases to predict consumer behaviors
 - Information Systems comprise a 5 component framework of
 - Computer hardware
 - Software
 - Data
 - Procedures
 - People
- 5 components linked together through networks
- Hardware: electronic components and gadgetry that make a computer system
 - Cds and other media are not hardware
- Software: programs, apps that run, operate on comp systems
- Data: building blocks of info (facts or observations)
- Procedures: instructions or processes that you follow to achieve objective
- People: actors who want to achieve a part. Outcome

What is MIS?

- Management information systems: help orgs achieve objectives by comprising development and use of info systems
- 3 Key Elements of MIS:
 - development and use
 - info systems
 - goals/objectives

DEVELOPMENT AND USE OF INFO SYSTEMS

- You will need to know how they work because it will help facilitate things in your career like working when the system is down, not getting ripped off by software solution consultants, knowing how the system works, etc

ACHIEVING BUSINESS GOALS AND OBJECTIVES

- Information systems are found in almost every type of enterprise/industry, nonprofit or social organization, government
- Some companies only develop MIS because other companies have it → not good
- Some companies are convinced by people that they NEED the new update when they don't
- We need to learn how to look through the lens of **organizational need**

How does IS Differ from IT?

- They are closely related but they are different
- Information Technology (IT): methods, inventions, standards, products
 - Raw technology (hardware, software, data components and how they are networked together)
- Information System: system of hardware, software, data, procedures and people who produce information
- IT by itself does not help an org achieve its goals
 - Only when IT is embedded into an IS does it become useful
- IS includes people into the equation, and IT does not
 - This makes a big diff in how you design and implement systems

How Important are Information Systems to our Economy?

- It is becoming increasingly important to our Canadian economy
- Industry Canada → government agency tht categorizes sectors and collects information about them
 - **Information and communication technology (ICT) sector**
- This sector collected over \$162 billion in revenue in 2010
- The growth in this sector annually is about 3.8%
 - Twice as high as that of the economy
 - Accounts for 0.5% of canadas GDP growth since 2002
 - More jobs
- Most of the money comes from the service industries
- People in the software/computer services are most highly paid

How do Successful Business Professionals Use Information Systems?

- Pretty much everyone interacts with a variety of info systems every day
 - E-mail, webpages, word processors, spreadsheets, powerpoint, phones
- We should understand technology so we can identify opps for innovation
- Business professionals need to consider IT and IS when they think about problems and opportunities that confront a department or organization

What is the Shape of Things to Come?

- Moore's Law: density of circuits on an integrated chip is doubling every 2 years or so
 - Cost of comps are declining and for same amount of money, capacity has increased
- Network effect: value received increases significantly as # users increases
 - Social networking, people who have fax machines, useless if theres only 1
- Shrinking of device size → tied to moores law
 - Adoption of location based services (GPS) and existence everywhere
- IT is all about innovation, so the future of IT is hard to predict
- We predict that in the future unlimited storage will be almost free
- Real world and virtual world will collide as WAN's become cheap, reliable and widely available
-

MODULE 2 NOTES

WHY DO YOU NEED TO KNOW ABOUT INFORMATION TECHNOLOGY?

- True understanding of tech is understanding past and present technology
- You can consider how it will work in business, its + and - affects on society

WHERE DID ALL THIS INFORMATION TECHNOLOGY STUFF COME FROM?

- First computing devices were in 1940s
- First commercial comps in 1950s
- First PCs in 1980s
- Cell phones → 1990s after world wide web invented

EARLY COMPUTERS: 1939-1952

- Early comps financed by US military
- First were firing tables for ballistic missiles
- Large, complex, expensive, ran one program at a time
- Computer bug or bug was coined when moth was caught b/w relays of calculator
- Comp in mobile phone in the present is 1000 times smaller and 10,000 times faster than earlier comps

MAINFRAMES: 1952-Present

- Large, room-sized, based on now obsolete vacuum tube technology
- Used by businesses and government
- Costs: \$200,000 to \$400,000
- Add or subtract 16,000 numbers per second
- Second gen → transistors
- Third gen → OS and multiprocessing capability
- Cost millions of dollars
- Only one user can interact with it at a time
- Mainframes are designed for fast processing and massive storage
- Will be useful for the future

MICROCOMPUTERS: 1975-PRESENT

- Microprocessor → early 1970s by TI and Intel
- CPU and short term memory into a single chip using integrated circuits (IC)
- Microcomputers: developed in 1975. No screen, users had to develop programs
- Microsoft created programming languages (BASIC) and OS's (DOS) for microcom

NETWORKING PERSONAL COMPUTERS: 1985-PRESENT

- LAN solved the lack of networking capability
- Ethernet: set of rules, protocols that allow connected devices to communicate and share info
- Connect many PC's together
- Shared access to data, printers, peripherals
- 1980s: WAN is made

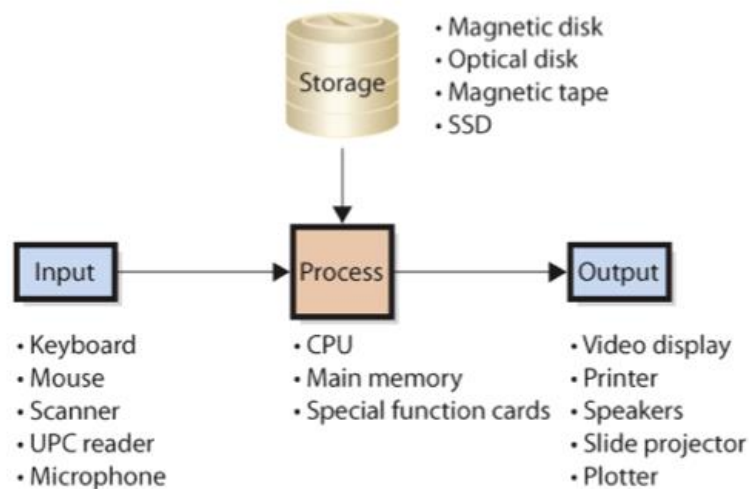
MOBILE AND TABLET COMPUTING: LATE 1990s-PRESENT

- Dot com bubble: new internet companies funded by venture capitalists and went bankrupt

- $K=1024$
- Lowering of costs for cellular tech made everyone buy it

WHAT DOES A MANAGER NEED TO KNOW ABOUT COMPUTER HARDWARE?

- Hardware: physical and electronic components and related gadgetry that input, process, output, store data according to instructions encoded in computer programs or software
- Computers consist of 4 components:
- Input (keyboard, mouse, scanner, mic, etc)
- Processing (CPU, main memory, special function cards)
- Output (video display, printer, speaker, plotter, projector, etc)
- Storage (magnetic disk, optical disk, magnetic tape, SSD)



INPUT, PROCESSING, OUTPUT AND STORAGE HARDWARE

- Input devices: one of two most visible or familiar parts of the computer
- Keyboard, touchscreen, scanner
- Processing devices → CPU: central processing unit
- Brain of the computer
- Selects instructions, processes them, performs arithmetic comparisons, stores results of operations in memory
- Measured in Hertz (hz) kilohertz (kHz) megahertz (mHz) gigahertz (GHz)
- Type of CPU depends on computing that you do

- Main memory: RAM
 - Cpu reads data/instructions from RAM and stores results of computations in the main memory
- Output hardware: more familiar or common part of a computer
- Most physical interaction with computer user by producing/displaying desired results of a computational task/request
- Storage hardware: saves data and programs
- Special function cards: added to comps to augment each of its components

COMPUTER DATA

- Binary digits: computers represents data in binary digits, called bits
- Either a 0 or a 1, easy to represent physically
- Switch can be open or closed
- Open switch represents 0, closed represents 1 if designed that way
- Small pits burned onto surface of disks so they reflect light
- Reflection means 1, no reflection means 0

Sizing Computer Bytes

- Computer data represented by bits
- Bits are grouped into 8 bit chunks called bytes
- Bytes can measure sizes of non-character data as well
- Kilobyte (k): 1024 bytes
- MB: 1024 k
- GB: 1024 MB
- TB: 1024 GB

HOW DOES A COMPUTER WORK?

- CPU is a major actor
- CPU must first transfer program/data from disk to main memory
- Moves instruction from main memory into the CPU by the data channel or bus
- CPU has a small amount of very fast memory, called a cache
- Computer's main memory contains program instructions for Excel
- Contains instructions for operating system
- Operating system controls computers resources and data blocks
- CPU loads programs into the memory in sections
- CPU removes blocks of memories to store more memory for opened program

- This is called memory swapping

WHY SHOULD A MANAGER CARE HOW A COMPUTER WORKS?

- Cache and main memory are volatile → lost when power goes off
- USB sticks, magnetic disks, optical disks → nonvolatile
- Hertz: speed or number of cycles per second a computer works at
- Gigahertz: billion cycles per second

WHAT IS THE DIFFERENCE BETWEEN A CLIENT AND A SERVER, AND WHAT IS CLOUD COMPUTING?

- Client: connects to a network
- Servers: provide services (facebook, google, amazon, youtube) accessed by comps
- Server farm: server that is a large collection of comps that coordinate activities
- Cloud computing: hardware, software, applications provided as a service, usually through a web browser
- Grid computing: several comps used to address a single problem at the same time
- Uses software to divide and apportion pieces of a program among several computers

WHAT DOES A MANAGER NEED TO KNOW ABOUT SOFTWARE?

- Software categorized into one of two varieties
- Operating systems (large complicated programs to control comps resources)
- Application software (programs that perform specific user tasks)
- Two important software constraints
- Each version of OS is developed for particular type of hardware
- Application programs are written to use on a particular OS

WHAT ARE THE 4 MAJOR OPERATING SYSTEMS?

- Windows
- Business users
- On more than 85% of world's desktops
- Mac OSX
- Apple comps can run in windows
- Accounts for less than 1/10 comp purchases
- Selling price is much higher
- Unix

- Developed at bell labs in the 1970s
- Workhorse of the scientific and engineering communities
- More diff to use than windows or mac
- Arcane language for manipulating files/data
- Not used by av business user
- Linux
- Developed by **open-source community**
- No fee to use it, used for servers (web servers in particular)
- IBM is primary proponent of Linux (no licence fee to use it)

OWNING VERSUS LICENSING

- What is actually purchased is a LICENCE to use that program, not program itself
- No one can sell you a licence to use Linux

WHAT TYPES OF APPS EXIST AND HOW DO ORGS USE THEM

- Application software: consists of programs that perform a business function
- Excel, word, quickbooks, etc

What Categories of Application Programs Exist?

- Horizontal market application software: provides capabilities common across all organizations and industries
- Word processors, graphics programs, spreadsheets, presentation programs
- Vertical market application software: serves needs of specific industry
- Dental offices use a specific program
- One-of-a-kind application software: for specific, unique need
- Canada Revnue Agency develops their own software bc of specific requirements that no other organization has
- CRM software is both vertical and horizontal (specific industry, unique needs)
- Buy computer software in the following ways:
 - Off the shelf
 - Off the shelf with alterations
 - Tailor made (custom developed software)
 - Custom development for software is difficult and risky
 - Costs are usually higher than forecasted
 - Adaptation of the software to company changes over time is costly

BROWSERS

- Debate about whether web browsers are application software or operating SW
- Have chars of both

WHAT ARE FIRMWARE AND UTILITY SOFTWARE?

- Firmware: comp software installed into such devices as printers, print servers, various types of communication devices
- Coding is similar to that of other software
- Program becomes part of the devices memory
- Driver software is utility software
- Other examples of utility: disk optimization, data encryption, file/data recovery
- Basic Input/Output System (BIOS): used when comp is initially booted up
- BIOS is required because all volatile memory is lost when comp shuts down
- Set of instructions to get comp running again through nonvolatile ROM
- First thing comp does when starting up is loads BIOS from ROM and runs commands
- BIOS checks to make sure memory and input devices are functional
- Once these are working, OS can be loaded

WHAT IS THE DIFF BW A THIN CLIENT AND A THICK CLIENT

- Thin client: app that requires nothing more than a browser
- Thick client: app that requires programs other than a browser on comp
- Microsoft outlook
- Thin and thick refer to amount of code needed to run on client comp
- Thick client doesn't need to access the network to run
- Still available if internet is down

WHAT ARE VIRUSES, WORMS AND ZOMBIES?

- Virus: comp program that replicates itself
- Virus ends up consuming comp's resources
- Payload: program code that causes unwanted activity
- Can delete programs, data, modify data in undetectable way
- Macro-viruses: attach themselves to word, excel, other documents
- When infected doc is opened, virus places itself in startup files of app
- After that, virus infects every file that app creates/processes
- Worm: virus that propagates using the Internet or other comp network

- Spread faster because they are programmed to spread
- Worms use network to spread, instead of waiting for someone to open a file
- Zombie: computers infected with the worm or virus
- Botnet: set of compromised comps and apps coordinated thru a network to perform malicious tasks
- In 2003, Slammer worm clogged Internet and caused Bank of America's ATM machines and information systems of hundreds of other orgs to fall
- Patch: fix security holes in comp programs
- Antivirus program

MODULE 3: WHY SHOULD I CARE ABOUT PRODUCTIVITY AND INNOVATION?

- In order to enhance productivity, we need innovation
- Productivity paradox: we see computers everywhere but in productivity statistics
- Question of how IT adds to productivity and creates business value is important
- It is hard to measure increase in productivity from IT additions
- How much time does it save? How much would the support it provides improve your performance?
- 3 different ways through which value of IT can be realized
- productivity (more or better output from same inputs)
- structure of competition- IT can alter way corporations compete
- benefits to the end customer- helps make processes more efficient
- might create cheaper goods, for example

WHAT IS BUSINESS TECHNOLOGY MANAGEMENT (BTM) AND HOW IS IT RELATED TO PRODUCTIVITY AND INNOVATION?

- It is important because it includes technologies that can enhance individual and organizational productivity across many industries
- It is seen as an invisible industry sector because it doesn't produce direct output as other industries do
- The need for students with combined technology and business skills has increased the need for educational programs that combine business and tech training
- Unis across Canada are developing programs for BTM

HOW DO INFORMATION SYSTEMS IMPROVE PRODUCTIVITY?

- Increasing efficiency means that business processes can be accomplished more quickly or with fewer resources and facilities (or both)
- Efficiency is usually easy to measure once you have decided what measures are important
- Effectiveness: focus on doing the right things

BUSINESS PROCESSES AND VALUE CHAINS

- Value chain: network of activities that improve effectiveness (or value) of a good or service
- Made up of at least one and often many business processes
- Intermediaries add value by adding to product or adding services to product
- The more a company adds to a good or service in its value chain, the higher the price the company can charge for the final product
- Diff between price the customer is willing to pay and cost that company incurs is defined as the margin (profit margin)
- Raw diamonds → sold at less than finished diamonds
- Greater the margin → greater the profit for the company
- Two types of activities that support value chains
- Primary activities (installing tires, manufacturing, shipping, directly adding value to product)
- Support activities (maintaining machines in factories, paying workers, keep track of mechanics hours, activities that support the primary activities)
- Support activities only add value indirectly
- Increasing efficiency and effectiveness increases the profit margin
- Primary activities
- Inbound logistics
- Operations
- Outbound logistics
- Marketing and sales
- Service

HOW ARE ORGANIZATIONAL STRATEGY AND INDUSTRY STRUCTURE RELATED?

- Porter's five forces model
- Fiveforces determine industry profitability
 - Bargaining power of customers

- Threat of substitutions
- Bargaining power of suppliers
- Threat of new entrants
- Rivalry among existing firms
- The intensity of each determines the characteristics of the industry, how profitable it is, and how sustainable that profitability will be
- Companies may also have power over their suppliers
- To be successful, organizations examine the 5 forces mentioned and determine how they intend to respond to them
- Responds to structure of its industry by choosing a competitive strategy
- 4 types of competitive strategies to respond with:
 - be a cost leader
 - differentiate products from those of the competition
 - employ the cost or differentiation strategy across an industry
 - focus strategy on a particular industry segment
- EXAMPLE: car rental company can provide lowest cost car rentals across industry, or seek to provide lowest cost car rentals to industry segment (for example, business travellers)
- ACCORDING TO PORTER → to be effective, org's goals, objectives, culture and activities must be consistent with the org's strategy
- All information systems must facilitate and be aligned with org's comp. strategy

WHAT IS THE RELATIONSHIP BETWEEN INNOVATION AND INFORMATION TECHNOLOGY?

- Two general types of technological innovations
- Sustaining technologies: changes in technology that maintain rate of improvement in customer value
- Vulcanization of rubber allowed tire manufacturers to produce tires that facilitated faster and more comfortable rides
- Disruptive technologies: introduce a very new package of attributes to the accepted mainstream products
 - Advent of MP3- offered ability to store and play music, no more buying CDs
- In some cases, competitive advantage is so large that it leads to a new industry
- Microcomputer
- Diffusion of innovation: process by which an innovation is communicated through certain channels over time among members of a social system

- 5 steps
- knowledge: first hear about innovation but lack info about it
- persuasion: become interested in innovation, find out more about it
- decision: consider pros and cons of adopting, make decision to Ac or Re
- implementation: use innovation and figure out whether to continue using it
- confirmation: use innovation to its full potential
- Way of thinking about process of adoption of new technology

HOW DO INFORMATION SYSTEMS PROVIDE COMPETITIVE ADVANTAGE

- Competitive advantages can be created by products/services or development of business processes

COMPETITIVE ADVANTAGE VIA PRODUCTS AND SERVICES

- Gain comp advantage by
- Creating new products or services
- Enhancing existing products or services
- Differentiating products and services from those of their competitors

COMPETITIVE ADVANTAGE VIA BUSINESS PROCESSES

- Orgs can retain customers by making it difficult or expensive for them to switch to another product (gym membership, phone plan)
- This is referred to as adding switching costs
- They can lock in suppliers by making it expensive for them to switch
- They can create entry barriers that make it difficult and expensive for new competition to enter the market
- They can establish alliances with other organizations
- This can create standards, promote product awareness and needs, develop market size, reduce purchasing costs, provide other benefits

CAN COMPETITIVE ADVANTAGE THROUGH INFO SYSTEMS BE SUSTAINED?

- Can the advantages be sustained?
- Usually other companies copy companies' information system innovations
- Technologies become like commodities after a while when everyone adopts them
- However, the same IT installed in diff organizations may have a diff outcome
- Companies need diff IT's depending on their structure

- Long term competitive advantage lies not with technology but rather in how a company and its people adopt the technology
- **Sustained competitive advantage:** requires companies to find a distinctive way to compete, will change over time
- Comes from developing people and procedures that are well supported by the underlying technology

MODULE 4: USING IS TO IMPROVE PROCESSES

- Hundreds/thousands of processes bring you a bagel in the morning
- All business activity comes about through the interaction of business processes

WHAT ARE THE FUNDAMENTAL TYPES OF PROCESSES IN ORGANIZATIONS?

- Business process: sequence of activities for accomplishing a function
- Activity: task within a business process
- Resources: items, such as people, comps, data necessary to accomplish activity
- Actors: resources who are either humans or comps
- Role: activities in a business process that is performed by actor

Examples of Processes

- To fulfill a pizza order:
 - Order
 - Assemble
 - Bake
 - Package
 - Deliver
- IS can be used to improve processes
- Both sequential processes and independent processes
- Ex: facebook to do events, turbotax to do taxes

Scope of Processes

- Landscape of business processes
- 3 categories
 - strategic: broad scope, organizational issues (more people)

- managerial: allocation and use of resources (mix of ppl and comps)
- Operational: common, routing, day to day (more comps than other processes)

Scope	Characteristics	Mix of Actors	Frequency	Examples	IS Supporting This Type of Process
Strategic	Broad-scope, organizational issues	More people than other processes	Low	Decide on new restaurant location, corporate budgeting	Executive support system (ESS)
Managerial	Allocation and use of resources	Mix	Medium	Assess seasonal promotions, plan and schedule cashiers	Management information system (MIS)
Operational	Common, routine, day-to-day	More computers than other processes	High	Order supplies, pay bills, check out customers	Transaction processing system (TPS)

- Strategic has low frequency, managerial has medium frequency, operational has high frequency
- Operational processes: common place, routine, everyday business processes → ordering supplies, paying bills etc.
- Rely more on comp actors
- Changing them is more difficult than changing other types because many actors contribute to this process
- Information systems used for this are transaction processing systems (TPS)
- Managerial processes: concern resource use, planning, assessing, analyzing resources in pursuit of objectives, ex. Which personnel to promote
- Occur less frequently and with less computerized actors
- Information systems used for this are management information systems (MIS)
- Strategic Processes: resolve issues that have long-range impact on the organization, broad scope and impact most of the firm, more human actors than operational or managerial processes
- Ex determining where to locate a new restaurant, setting budgets, introducing new product
- Information system for this is called executive support system (ESS)

Objectives of Processes

- Objective: desired goal an org has decided to pursue
- Objective be effective or efficient
- Effective objective: helps achieve organizational strategy

- Ex: objective of pizza shop Sales process is to sell to freshmen
- Efficient objective: seeks more output with the same inputs or same output with fewer inputs
- Ex. Pizza shop tries to improve efficiency of Deliver process by reducing unnecessary delays
- Effective objectives help achieve company strategy → doing things right
- Efficient objectives seek to conserve limited resources → doing the right things
- These 2 categories of objectives can occur during any of the 3 processes

WHAT ARE EXAMPLES OF COMMON BUSINESS PROCESSES

- Three characteristics of processes
- Scope (strategic, managerial, operational)
- Objectives (effective, efficient)
- Place within value chain

Inbound Logistics Processes

- Receives, stores, disseminates product input
- Procurement: operational process that acquires goods and services
- Ordering ingredients

Operations Processes

- Transform inputs into outputs
- Schedule equipment, people, facilities necessary to build or assemble product/service

EXAMPLE OF PROCESSES W/ VALUE CHAIN INTO CONSIDERATION: PG 136

Outbound Logistics Processes

- Collect, store, distribute products to buyers
- Management of finished goods inventory and movement of goods from that inventory to the customer
- Sales process: records sales order, ships product, bills customer.
- Example of operational outbound process

Sales and Marketing Processes

- Provide means and incentives for customers to purchase product/service
- Strategic marketing process: launch new product, open new restaurant

Service Processes

- Providing after sales support to enhance or maintain value of a product
- Operational customer service processes: tracking orders, customer support, customer support training
- Management: evaluate customer complaints
- Strategic: evaluating outsourcing service options

Human Resources Processes

- Assess motivations and skills of employees, create job positions, investigate employee complaints, train, staff evaluate personnel
- Operational human resources process: recruit, compensate, assess employee performance
- Management processes: development/training of organization's workforce
- Strategic processes: pay scales, authorize incentive types, decide org structure

Technology Development Processes

- Designing, testing, developing technology in support of primary activities
- Operational process: tests whether new software can handle keystrokes
- Managerial: estimates time required for each step in software dvlpmt process
- Strategic: decide whether technology should be purchased or dvlped by company

HOW CAN ORGANIZATIONS IMPROVE PROCESSES

- Three fundamental steps in a process for improving processes
- Objectives
- Measures
- Information Systems
- OMIS Model ^

Process Objectives

- Each model has 1+ objective
- Unstated and explicitly stated objectives
- Mgmt. may fight over stating objectives
- Inappropriate objectives → not matched to the strategy
- Vague objective → not specific → increase sales
- Objectives:

- Classify objectives as effectiveness or efficiency
- Make objectives explicit
- Obtain agreement about objectives
- Ensure that objectives are not vague/inappropriate
- Measures: specify and improve
- IS: Implement IS improvements

Process Measures

- Measures are also called metrics
- Quantities assigned to attributes
- Can be:
- Common
- Unique
- MEASURES MUST BE: REASONABLE, ACCURATE, CONSISTENT
- Reasonable: valid and compelling

HOW CAN ORGANIZATIONS USE IS TO IMPROVE PROCESSES?

Three ways IS Improve Processes

- 1) Improve efficiency or effectiveness of activities
- 2) Improving links among activities either in same processes or among activities in diff processes
- Linkage: impact of one activity on another activity
- 3) Improve control of the process
- Control: limits behavior → make every pizza the same size, same temperature
- These all show how to improve processes by using information systems

Non-IS Process Improvements

- Two general categories
- Add more resources
- Change structure of the process
- Six Sigma: most common approach to process improvement (part in manufacturing ind)
- Improve process outputs by removing causes of defect and minimizing variability in the process

Participants and Diagrams in Process Improvement

- As-is diagrams: diagrams of the current process
- Ought-to-be diagrams: diagrams of suggested improvements
- BPMN: diagram
- Objectives: good quality, low cost → effectiveness, efficiency.

HOW CAN IS HINDER A PROCESS?

- Storing data in multiple places can hinder a process and make it difficult to improve

Information Silos

- Information silos: Maintaining data in multiple places
- Data can be duplicated in various places → if one copy is changed, then not all copies are the same
- Fix it by storing only one copy

Why Information Silos May Exist

- Running out of items because not all info is in one system
- Why does this happen then?
- One department may want to have control over system they use
- One deptmt may have diff objective than other
- Departmental IS is more affordable → enterprise systems can cost 10 to 50 times as much than a single-department application

HOW CAN SOA IMPROVE PROCESSES?

- SOA: services oriented architecture: makes it easier to share data among process activities
- Facilitates data sharing and improves control by enforcing standards
- Originally used to design interacting, widely distributed, internet-based computer programs
- Enables development of middleware
- Middleware: software that sits between 2 programs and facilitates interprogram communication and data sharing
- SOA is a design philosophy
- 2 previous design philosophies
- standalone computers
- client-server architecture
- SOA is a design where every activity is modeled as an encapsulated service and exchanges among those services are governed by standards

- Definition has 3 key terms:
- Service: repeatable task that a business needs to perform
- Encapsulation: hides details inside a container
 - Allows devices to communicate containers of data without being concerned about data inside
- Standards: data and messages are exchanged among services using standardized formats and techniques, which are referred to as SOA standards.

CHAPTER 6

Which of the following are examples of Business Processes?

- ☐ Managing cash receipts.
- ☐ Collecting sales tax.
- ☐ Processing bills of material.
- ☐ Applying healthcare benefits.
- ☐ None of these.
- ☐ All of these.

A(n) ____ is a collection of related activities that produce a product or a service of value to an organization.

- ☐ information system

- ☐ management technique
- ☐ workflow pattern
- ☐ supply chain
- ☐ business process

The goals of business process reengineering are to (check all that apply):

- ☒ Increase productivity.
- ☒ Optimize operations.
- ☒ Increase customer satisfaction.
- ☒ Reduce waste.
- ☐ Increase cycle time.

When comparing BPI initiatives to BPR projects, which of the following statements are true? (Select all that apply)

- ☒ BPI consumes fewer organizational resources
- ☒ BPI is less costly
- ☐ BPI delivers greater performance gains
- ☐ BPI takes more time
- ☒ BPI is less risky

Chapter 7

Which system supports business processes end to end?

- ☐ Management System
- ☐ Accounting System
- ☒ Enterprise System
- ☐ Functional Structure
- ☐ Document System

Within the financial structure, typical functions or departments found in a modern organization include which of the following?

- ☒ purchasing
- ☒ operations
- ☐ internships
- ☒ finance

- ☒ marketing

Which processes track the impact on the organization's finances?

- ☒ Financial accounting processes
- ☐ Project management processes
- ☒ Management accounting or controlling processes
- ☐ Material planning process
- ☐ Procurement process

Which of the following are components of the procurement process?

- ☒ Warehouse
- ☒ Purchasing
- ☐ Sales
- ☐ Operations
- ☒ Accounting

Which of the following activities are related to the fulfillment process?

- ☒ Locate Materials
- ☒ Prepare Shipment
- ☐ Prepare for Storage
- ☐ Store Materials
- ☒ Ship to Customer

What parts of the various functional areas are also part of the project management process?

- ☒ Budgeting
- ☒ Execution
- ☒ Settlement
- ☒ Planning

Which term refers to all of the activities involved in buying or acquiring the materials used by the organization, such as raw materials needed to make products?

- ☐ Material Planning
- ☒ Procurement Process
- ☐ Production Process

- ☐ Fulfillment Process
- ☐ Lifecycle Data Management

Which process uses historical data and sales forecasts to plan which materials will be procured and produced?

- ☒ Material Planning
- ☐ Procurement Process
- ☐ Production Process
- ☐ Fulfillment Process
- ☐ Lifecycle Data Management

What steps are involved in the accounting portion of the procurement process?

- ☐ Receiving the materials and the invoice
- ☐ Creating the purchase requisition and sending payment
- ☐ Creating and sending the purchase order
- ☐ Creating the purchase requisition and receiving the materials

- ☒ Receiving the invoice and sending payment

What is the first step of the production process?

- ☐ Authorize Production
- ☒ Request Production
- ☐ Create Product
- ☐ Receive Finished Goods
- ☐ Issue Raw Materials

What function does the warehouse perform in the fulfillment process?

- ☒ Prepares and sends the shipment to the customer
- ☐ Communicates data related to the order to other parts of the organization
- ☐ Tracks the order
- ☐ Notifies the customer
- ☐ None of the above

Which of the following products fall(s) within GBI's line of business?

- ☒ Deluxe and professional touring bikes
- ☒ Men and women's off-road bikes
- ☐ Motor bikes
- ☒ Bike accessories

What is true about SAP R/3?

- ☐ Supports a single function or department
- ☒ Executes every process from start to finish
- ☒ Consolidates process data in a single database
- ☒ Enables users to view the status of a process in real time

Chapter 8

A three-tier architecture includes which of the following components?

- ☐ Operating system layer
- ☒ Data layer
- ☒ Presentation layer
- ☒ Application layer
- ☐ Network layer

Which of the following SAP systems are used to support inter-company processes?

- ☒ SAP SCM
- ☒ SAP CRM
- ☐ Production planning (PP) module
- ☐ Materials management (MM) module
- ☐ Strategic enterprise management (SEM) module

Which of the following statements concerning transaction data are true?

- ☐ Transaction data represent entities such as customers and vendors.
- ☐ Transaction data define the structure of an enterprise.
- ☒ Transaction data are a consequence of the execution of process steps.
- ☒ Transaction data are constantly changing.

- ☐ Transaction data change infrequently.

Supply chain management deals with

- ☐ Managing relationships with suppliers
- ☒ Planning for production demand requirements
- ☒ Optimizing transportation and logistics for materials
- ☐ Providing data to help manage sales

Which term relates to the technical capabilities that allow systems to connect with one another through standardized interfaces called Web services?

- ☐ Supply Chain Management
- ☐ Architecture
- ☐ Service-Oriented Architecture
- ☐ Enterprise Resource Planning
- ☐ None of the above

Which of the following is used to integrate several client-server applications and create enterprise mash-ups, or composite applications?

- ☐ Management System
- ☐ Accounting System
- ☐ All of the above
- ☐ Web Services
- ☐ Enterprise System

Which of the following is(are) used to capture specified transaction data in an aggregated and summarized form that enables users to analyze the data as needed.

- ☐ Reporting
- ☐ Evaluating
- ☐ Information Structures
- ☐ Period Definition
- ☐ Online Analytic Processing (OLAP)

Which of the following terms refers to an organizational element that performs multiple functions and is relevant to several processes?

- ☐ Warehouse
- ☐ Procurement
- ☐ Plant
- ☐ Fulfillment
- ☐ Lifecycle Data Management

Which term is generally used to describe the ways that users can view and analyze data to help them make decisions and complete their tasks?

- ☐ Reporting
- ☐ Evaluating ☐ Characteristics
- ☐ Period Definition
- ☐ Online Analytic Processing (OLAP)

6.1 Business Processes



Video Lesson: Business Processes **Video Lesson: Business Processes**

A [business process](#) is an ongoing collection of related activities that create a product or a service of value to the organization, its business partners, and/or its customers. The process involves three fundamental elements:

- **Inputs:** Materials, services, and information that flow through and are transformed as a result of process activities

- **Resources:** People and equipment that perform process activities
- **Outputs:** The product or a service created by the process

If the process involves a customer, then that customer can be either internal or external to the organization. A manager who is the recipient of an internal reporting process is an example of an internal customer. In contrast, an individual or a business that purchases the organization's products is the external customer of the fulfillment process.

Successful organizations measure their process activities to evaluate how well they are executing these processes. Two fundamental metrics that organizations employ in assessing their processes are efficiency and effectiveness. *Efficiency* focuses on doing things well in the process; for example, progressing from one process activity to another without delay or without wasting money or resources. *Effectiveness* focuses on doing the things that matter; that is, creating outputs of value to the process customer—for example, high-quality products.

Many processes cross functional areas in an organization. For example, product development involves research, design, engineering, manufacturing, marketing, and distribution. Other processes involve only a single functional area. Table 6.1 identifies the fundamental business processes performed in an organization's functional areas.

Table 6.1 Examples of Business Processes

<i>Accounting Business Processes</i> • Managing accounts payable • Managing accounts receivable • Reconciling bank accounts • Managing cash receipts	• Managing invoice billing • Managing petty cash • Producing month-end closing • Producing virtual closing
<i>Finance Business Processes</i> • Managing account collection • Managing bank loan applications • Producing business forecasts • Applying customer credit approval and credit terms	• Producing property tax • Managing stock transactions • Generating financial statements
<i>Marketing Business Processes</i> • Managing post-sale customer follow-up • Collecting sales taxes • Applying copyrights and trademarks • Using customer satisfaction surveys • Managing customer service	• Handling customer complaints • Handling returned goods • Producing sales leads • Entering sales orders • Training sales personnel
<i>Production/Operations Management Business Processes</i> • Processing bills of materials • Processing manufacturing change orders • Managing master parts list and files	• Managing quality control • Auditing for quality assurance • Receiving, inspecting, and packing • Handling shipping and receiving

- Managing packing, storage, and distribution
- Processing physical inventory
- Managing purchasing
- Handling vendor selection

Human Resources Business Processes

- Applying disability policies
- Managing employee hiring
- Handling employee orientation
- Managing files and records
- Applying healthcare benefits
- Managing pay and payroll
- Producing performance appraisals
- Managing resignations and terminations
- Applying training/tuition reimbursement
- Managing travel and entertainment
- Managing workplace rules and discipline
- Overseeing workplace safety

Management Information Systems Business Processes

- Antivirus control
- Computer security issues incident reporting
- Training computer users
- Computer user/staff training
- Applying disaster recovery procedures
- Applying electronic mail
- Generating Internet use reports
- Managing service agreements
- Applying user workstation policies
- Managing the use of peripheral devices

Cross-Functional Processes

All of the business processes in Table 6.1 fall within a single functional area of the company. However, many other business processes, such as procurement and fulfillment, cut across multiple functional areas; that is, they are cross-functional business processes, meaning that no single functional area is responsible for their execution. Rather, multiple functional areas collaborate to perform the process. For a cross-functional process to be successfully completed, each functional area must execute its specific process steps in a coordinated, collaborative way. To clarify this point, let's take a look at the procurement and fulfillment [cross-functional processes](#). We discuss these processes in greater detail in Chapter 10.

The *procurement process* includes all of the tasks involved in acquiring needed materials externally from a vendor. Procurement comprises five steps that are completed in three different functional areas of the firm: warehouse, purchasing, and accounting.

POM The process begins when the warehouse recognizes the need to procure materials, perhaps due to low inventory levels. The warehouse documents this need with a purchase requisition, which it sends to the purchasing department (step 1). In turn, the purchasing department identifies a suitable vendor, creates a purchase order based on the purchase requisition, and sends the order to the vendor (step 2). When the vendor receives the purchase order, it ships the materials, which are received in the warehouse (step 3). The vendor then sends an invoice, which is received by the accounting department (step 4).

Accounting sends payment to the vendor, thereby completing the procurement process (step 5).

The *fulfillment process* is concerned with processing customer orders. Fulfillment is triggered by a customer purchase order that is received by the sales department. Sales then validates the purchase order and creates a sales order. The sales order communicates data related to the order to other functional areas within the organization, and it tracks the progress of the order. The warehouse prepares and sends the shipment to the customer. Once accounting is notified of the shipment, it creates an invoice and sends it to the customer. The customer then makes a payment, which accounting records.

An organization's business processes can create a competitive advantage if they enable the company to innovate or to execute more effectively and efficiently than its competitors. They can also be liabilities, however, if they make the company less responsive and productive. Consider the airline industry. It has become a competitive necessity for all of the airlines to offer electronic ticket purchases via their Web sites. To provide competitive advantage, however, these sites must be highly responsive and they must provide both current and accurate information on flights and prices. An up-to-date, user-friendly site that provides fast answers to user queries will attract customers and increase revenues. In contrast, a site that provides outdated or inaccurate information, or has a slow response time, will hurt rather than improve business.

Clearly, good business processes are vital to organizational success. But how can organizations determine if their business processes are well designed? The first step is to document the process by describing its steps, its inputs and outputs, and its resources. The organization can then analyze the process and, if necessary, modify it to improve its performance.

To understand this point, let's consider the e-ticketing process. E-ticketing consists of four main process activities: searching for flights, reserving a seat, processing payment, and issuing an e-ticket. These activities can be broken down into more detailed process steps. The result may look like the process map in Figure [6.1](#). Note that different symbols correspond to different types of process steps. For instance, rectangles (steps) are activities that are performed by process resources (reserve seats, issue e-ticket). Diamond-shaped boxes indicate decisions that need to be made (seats available?). Arrows are used as connectors between steps; they indicate the sequence of activities.

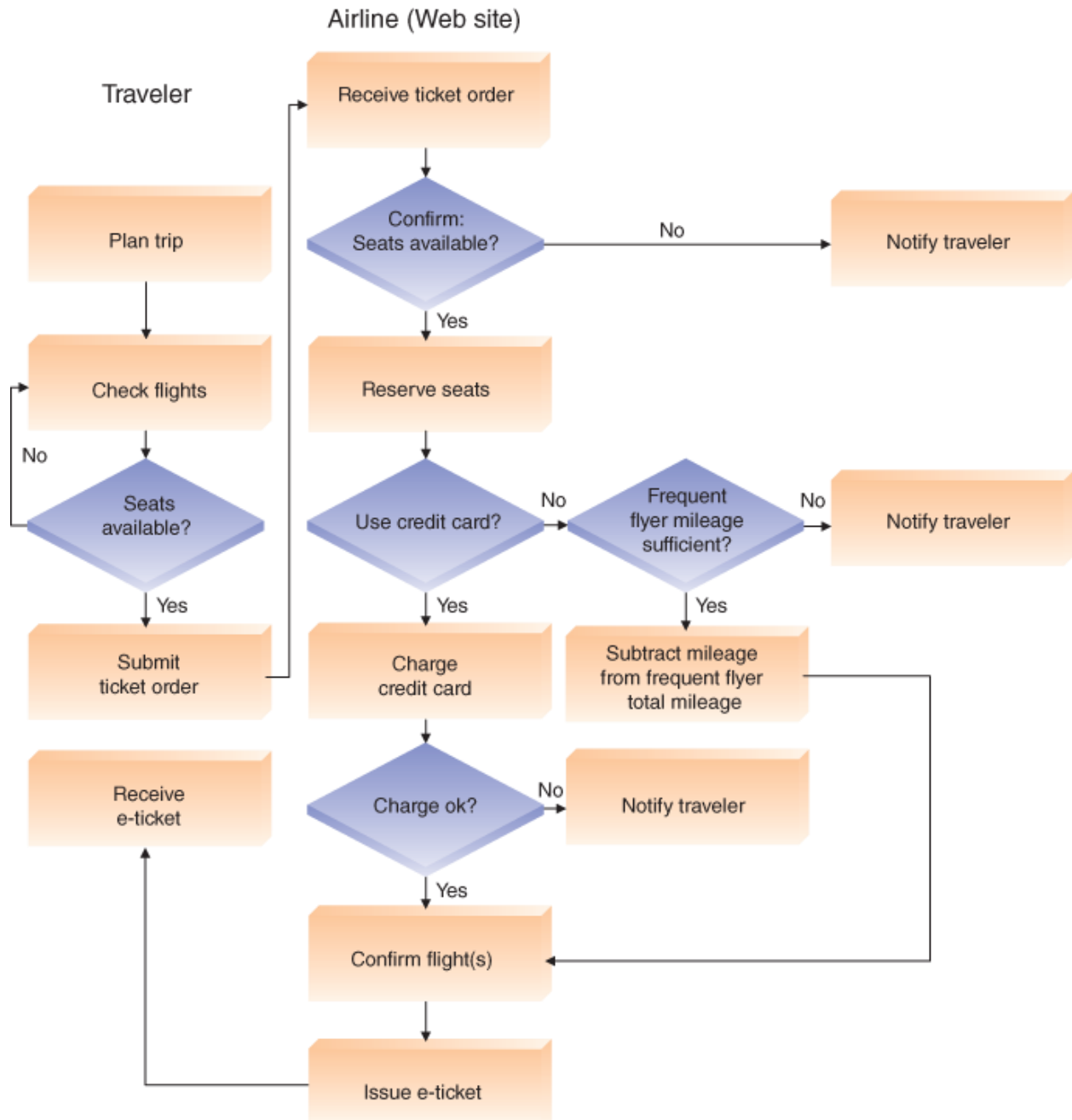


FIGURE 6.1 Business process for ordering e-ticket from airline Web site.

These symbols are important in the process flowchart (which is similar to a programming flowchart). Other symbols may be used to provide additional process details. For example, D-shaped boxes are used instead of rectangles when a waiting period is part of a process; ovals can show start and stop points; and process resources can be attached to activities with resource connector lines, or included as an annotation or property for each activity box.

The customers of the process are travelers planning a trip, and the process output is an e-ticket. Travelers provide inputs to the process: the desired travel parameters to begin the search, the frequent flyer miles number, and their credit card information. In addition, a computerized reservation system that stores information for many airlines also provides some of the process inputs—such as the seat availability and prices. The resources used in the process are the airline Web site, the computerized reservation system, and, if the customer calls the airline call center at any time during the process, the call center system and the human travel agents. The process creates customer value by efficiently generating an output that meets the customer search criteria—dates and prices. The performance of the process depends on efficiency metrics such as the time required to purchase an e-ticket, from the moment the customer initiates the ticket search until he or she receives the e-ticket. Effectiveness metrics include customer satisfaction with the airline Web site. Finally, the performance of the process may be affected if the quality or the timeliness of the inputs is low—for example, if the customer enters the wrong dates—or if the process resources are not available—for example, if the Web site crashes before the purchase is finalized.

Information Systems and Business Processes

MIS An information system (IS) is a critical enabler of an organization's business processes. Information systems facilitate communication and coordination among different functional areas, and allow easy exchange of, and access to, data across processes. Specifically, ISs play a vital role in three areas:

- Executing the process
- Capturing and storing process data
- Monitoring process performance

In this section, you will learn about each of these roles. In some cases the role is fully automated—that is, it is performed entirely by the IS. In other cases, the IS must rely on the manager's judgment, expertise, and intuition. IT's About Business [6.1](#) shows how NASCAR uses information technology to streamline its pre-race process.

IT's About Business 6.1

POM NASCAR Uses IT in Its Pre-Race Inspection

The National Association for Stock Car Auto Racing (NASCAR; www.nascar.com) is a family-owned-and-operated business that governs multiple auto racing events. One of NASCAR's key business processes is the pre-race inspection of the cars. The rationale for pre-race inspection is to ensure that all cars are as evenly matched as possible.

Pre-race inspection begins two days before a race. Each car on the entry list for a particular race must pass a thorough inspection to compete. Here is how the process works.

In the first inspection, NASCAR officials assess whether a car meets NASCAR requirements—for example, height off the ground at the front and the back of the car, weight, fuel tank capacity, and many other factors. Cars that meet these requirements are cleared to practice, and they qualify for the race.

If a car does not pass the first inspection, then NASCAR allows that team to fix the problem and undergo a second inspection. However, the team is sent to the end of the line. This process can cause a backup of cars waiting to be cleared before the race. In the past, NASCAR would allow a team with a violation to keep its spot in line while it fixed the problem, essentially cutting in front of teams still waiting to undergo the initial inspection. That situation meant that crew chiefs had little incentive when trying to repair violations. If the repair did not fix the violation, they would simply try again.

After the first inspection, each team has two days before the race to work on their cars. After each team qualifies, NASCAR conducts a second, postqualifying inspection. On race morning, all cars are inspected one final time.

Historically, NASCAR officials performed the pre-race inspection by walking to each inspection station and visually observing each car. Moreover, they recorded their observations on paper forms. These forms contained more than 100 items clustered in categories depending on the type of inspection. The form would remain with each vehicle as it went through the inspection process. Each season, NASCAR used roughly 25,000 sheets of paper for inspections.

In September 2014, NASCAR implemented an app from Microsoft that incorporates everything from the paper-based form, but in a more informative format. Each vehicle is shown on a dashboard that tracks its stages through the inspection process. The dashboard also uses color-coded flags to highlight violations. NASCAR officials can be alerted to any pending issues for each vehicle and they can access the NASCAR rulebook at the press of a digital button. Officials can also add digital notes and photographs to detail any infractions. In addition, the app enables officials to determine whether pre-race inspections are on time. Finally, the race director can use his tablet to monitor each inspection station, identify which cars have been cited for violations, and find out the status of every car.

The Microsoft app has simplified the pre-race inspection process. Consider, for instance, that the paper form needed a NASCAR official's signature on every item. In contrast, the app by default assumes every item's status is good unless otherwise noted by officials.

One interesting benefit of the app is the cumulative value of the collected data. Information on the pre-race inspections of all vehicles is collected and stored in real time. Consequently, NASCAR executives can identify trends and patterns to help maintain a level playing field for all racers.

Sources: Compiled from N. Linhart, "NASCAR App Improves Inspection Efficiency," *Charlotte Sun Times*, February 10, 2015; J. Gluck, "App Improves NASCAR Inspection Process," *USA Today*, February 9, 2015; "Going Through Inspections," *NASCAR.com*, January 5, 2015; "A Day at the Track for a NASCAR Race," *NASCAR.com*, January 5, 2015; J. Richter, "NASCAR Pre-Race Inspection? There's an App for That," *Fox Sports*, October 23, 2014; T. Bradley, "NASCAR Turns to Microsoft and Windows 8 to Streamline Race Operations," *Forbes*, October 21, 2014; J. Hammond, "NASCAR Inspections a Work in Progress," *Fox Sports*, June 6, 2014; www.nascar.com, accessed March 2, 2015.

Questions

1.

Describe why pre-race inspection is a business process for NASCAR.

2.

Describe the various benefits that the app provides NASCAR.

3.

Refer back to Chapter 5. Is the app a strategic information system for NASCAR? Why or why not? Support your answer.

Executing the Process.

An IS helps organizations execute processes efficiently and effectively. ISs are typically embedded into the processes, and they play a critical role in executing the processes. In other words, an IS and the processes are usually intertwined. If the IS does not work, the process cannot be executed. IS helps execute processes by informing people when it is time to complete a task, by providing the necessary data to complete the task, and, in some cases, by providing the means to complete the task.

In the procurement process, for example, the IS generates the purchase requisitions and then informs the purchasing department that action on these requisitions is needed. The accountant will be able to view all shipments received to match an invoice that has been received from a supplier and verify that the invoice is accurate. Without the IS, these steps, and therefore the process, cannot be completed. For example, if the IS is not available, how will the warehouse know which orders are ready to pack and ship?

In the fulfillment process, the IS will inform people in the warehouse that orders are ready for shipment. It also provides them with a listing of what materials must be included in the order and where to find those materials in the warehouse.

Capturing and Storing Process Data.

Processes create data such as dates, times, product numbers, quantities, prices, and addresses, as well as who did what, when, and where. IS captures and stores these data, commonly referred to as *process data* or *transaction data*. Some of these data are generated and automatically captured by the IS. These are data related to who completes an activity, when, and where. Other data are generated outside the IS and must be entered into it. This data entry can occur in various ways, ranging from manual entry to automated methods involving data in forms such as bar codes and RFID tags that can be read by machines.

In the fulfillment process, for example, when a customer order is received by mail or over the phone, the person taking the order must enter data such as the customer's name, what the customer ordered, and how much he or she ordered. Significantly, when a customer order is received via the firm's Web site, then all customer details are captured by the IS. Data such as the name of the person entering the data (who), at which location the person is completing the task (where), and the date and time (when) are automatically included by the IS when it creates the order. The data are updated as the process steps are executed. When the order is shipped, the warehouse will provide data about which products were shipped and in what quantities, and the IS will automatically include data related to who, when, and where.

An important advantage of using an IS compared to a manual system or multiple functional area information systems is that the data need to be entered into the system only once. Further, once they are entered, other people in the process can easily access them, and there is no need to reenter them in subsequent steps.

The data captured by the IS can provide immediate feedback. For example, the IS can use the data to create a receipt or to make recommendations for additional or alternative products.

Monitoring Process Performance.

A third contribution of IS is to help monitor the state of the various business processes. That is, the IS indicates how well a process is executing. The IS performs this role by evaluating information about a process. This information can be created either at the *instance level* (i.e., a specific task or activity) or at the *process level* (i.e., the process as a whole).

For example, a company might be interested in the status of a particular customer order. Where is the order within the fulfillment process? Was the complete order shipped?

If so, when? If not, then when can we expect it to be shipped? Or, for the procurement process, when was the purchase order sent to the supplier? What will be the cost of acquiring the material? At the process level, the IS can evaluate how well the procurement process is being executed by calculating the lead time, or the time between sending the purchase order to a vendor and receiving the goods, for each order and each vendor over time.

Not only can the IS help monitor a process, but it can also detect problems with the process. The IS performs this role by comparing the information with a standard—that is, what the company expects or desires—to determine if the process is performing within expectations. Management establishes standards based on organizational goals.

If the information provided by the IS indicates that the process is not meeting the standards, then the company assumes that some type of problem exists. Some problems can be routinely and automatically detected by the IS, whereas others require a person to review the information and make judgments. For example, the IS can calculate the expected date that a specific order will be shipped and determine whether this date will meet the established standard. Or, the IS can calculate the average time taken to fill all orders over the last month and compare this information with the standard to determine if the process is working as expected.

Monitoring business processes, then, helps detect problems with these processes. Very often these problems are really symptoms of a more fundamental problem. In such cases, the IS can help diagnose the cause of the symptoms by providing managers with additional, detailed information. For example, if the average time to process a customer order appears to have increased over the previous month, this problem could be a symptom of a more basic problem.

A manager can then drill down into the information to diagnose the underlying problem. To accomplish this task, the manager can request a breakdown of the information by type of product, customer, location, employees, day of the week, time of day, and so on. After reviewing this detailed information, the manager might determine that the warehouse has experienced an exceptionally high employee turnover rate over the last month and that the delays are occurring because new employees are not sufficiently familiar with the process. The manager might conclude that this problem will work itself out over time, in which case there is nothing more to be done. Alternatively, the manager could conclude that the new employees are not being adequately trained and supervised. In this case, the company must take actions to correct the problem. The following section discusses several methodologies that managers can use to take corrective action when process problems are identified.

Before you go on...

6.1

What is a business process?

6.2

Describe several business processes carried out at your university.

6.3

Define a cross-functional business process, and provide several examples of such processes.

6.4

Pick one of the processes described in Question [6.2](#) or [6.3](#) above, and identify its inputs, outputs, customer(s), and resources. How does the process create value for its customer(s)?

Apply the Concept6.1

LEARNING OBJECTIVE6.1

Discuss ways in which information systems enable cross-functional business processes and business processes for a single functional area.

- **STEP 1 Background (This is what you are learning.)**

This Plug IT In defines a business process as an ongoing collection of related activities that create a product or a service of value to the organization, its business partners, and/or its customers. Normally, we do not see everything that goes into a process; rather, we observe only the results of the process. For example, when you shop at a grocery store, you see stocked shelves. However, the inventory management processes that operate to keep the shelves stocked— as well as the information systems that support those processes —remain essentially invisible.

- **STEP 2 Activity (This is what you are doing.)**

Visit [//www.wiley.com/go/rainer/MIS4e/applytheconcept](http://www.wiley.com/go/rainer/MIS4e/applytheconcept), and click on the link provided for Plug IT In [6.1](#). This link will take you to a YouTube video that focuses on workflow and business process management in a healthcare environment. As you watch the video, look for the ways that information systems enable cross-functional business processes and make the flow of data much easier and quicker for everyone involved.

- **STEP 3 Deliverable (This is what you turn in.)**

Based on the video from Step 2, write a brief description of how information systems enable both cross-functional business processes and business processes for a single functional area. Submit your description to your instructor.

6.2 Business Process Improvement, Business Process Reengineering, and Business Process Management



[Video Lesson: Business Process Improvement, Reengineering and BPM](#)
[Video Lesson: Business Process Improvement, Reengineering and BPM](#)

Excellence in executing business processes is widely recognized as the underlying basis for all significant measures of competitive performance in an organization. Consider the following measures, for example:

- *Customer satisfaction*: The result of optimizing and aligning business processes to fulfill customers' needs, wants, and desires.
- *Cost reduction*: The result of optimizing operations and supplier processes.
- *Cycle and fulfillment time reduction*: The result of optimizing the manufacturing and logistics processes.
- *Quality*: The result of optimizing the design, development, and production processes.
- *Differentiation*: The result of optimizing the marketing and innovation processes.
- *Productivity*: The result of optimizing each individual's work processes.

The question is: How does an organization ensure business process excellence?

In their book *Reengineering the Corporation*, first published in 1993, Michael Hammer and James Champy argued that to become more competitive, American businesses needed to radically redesign their business processes to reduce costs and increase quality. The authors further asserted that information technology is the key enabler of such change. This radical redesign, called [business process reengineering \(BPR\)](#), is a strategy for making an organization's business processes more productive and profitable. The key to BPR is for enterprises to examine their business processes from a “clean sheet” perspective and then determine how they can best reconstruct those processes to improve their business

functions. BPR's popularity was propelled by the unique capabilities of information technology, such as automation and standardization of many process steps and error reduction due to improved communication among organizational information silos.

Although some enterprises have successfully implemented BPR, many organizations found this strategy too difficult, too radical, too lengthy, and too comprehensive. The impact on employees, on facilities, on existing investments in information systems, and even on organizational culture was overwhelming. Despite the many failures in BPR implementation, however, businesses increasingly began to organize work around business processes rather than individual tasks. The result was a less radical, less disruptive, and more incremental approach, called business process improvement (BPI).

BPI focuses on reducing variation in the process outputs by searching for root causes of the variation in the process itself (e.g., a broken machine on an assembly line) or among the process inputs (e.g., a decline in the quality of raw materials purchased from a certain supplier). BPI is usually performed by teams of employees that include a process expert—usually the process owner (the individual manager who oversees the process)—as well as other individuals who are involved in the process. These individuals can be involved directly; for example, the workers who actually perform process steps. Alternatively, these individuals can be involved indirectly; for example, customers who purchase the outputs from the process.

Six Sigma is a popular methodology for BPI initiatives. Its goal is to ensure that the process has no more than 3.4 defects per million outputs by using statistical methods to analyze the process. (A defect is defined as a faulty product or an unsatisfactory service.) Six Sigma was developed by Motorola in the 1980s, and it is now used by companies worldwide, thanks in part to promotional efforts by early adopters such as GE. Six Sigma is especially appropriate for manufacturing environments, where product defects can be easily defined and measured. Over the years, the methodology has been modified so that it focuses less on defects and more on customer value. As a result, it can now be applied to services as well as to products. Today, Six Sigma tools are widely used in financial services and healthcare institutions as components of process-improvement initiatives.

Regardless of the specific methodology you use, a successful BPI project generally follows five basic phases: define, measure, analyze, improve, and control (DMAIC).

- In the *define phase*, the BPI team documents the existing “as is” process activities, process resources, and process inputs and outputs, usually as a graphical process map or diagram. The team also documents the customer and the customer's requirements for the process output, together with a description of the problem that needs to be addressed.

- In the *measure phase*, the BPI team identifies relevant process metrics, such as time and cost to generate one output (product or service), and collects data to understand how the metrics evolve over time. Sometimes the data already exist, in which case they can be extracted from the IS that supports the process, as described in the previous section. Many times, however, the BPI team needs to combine operational process data already stored in the company's IS systems with other data sources, such as customer and employee observations, interviews, and surveys.

-

In the *analysis phase*, the BPI team examines the “as is” process map and the collected data to identify problems with the process (e.g., decreasing efficiency or effectiveness) and their root causes. If possible, the team should also benchmark the process; that is, compare its performance with that of similar processes in other companies, or other areas of the organization. The team can employ IT applications such as statistical analysis software or simulation packages in this phase.

It is often valuable to use process simulation software during the analysis phase. Utilizing this software provides two benefits. First, it enables a process manager to quickly simulate a real situation (e.g., with a certain number of people undertaking activities) for a specific amount of time (e.g., a working day, a week, or a month). The manager can then estimate the process performance over time without having to observe the process in practice. Second, it allows the manager to create multiple scenarios; for instance, using a different number of resources in the process and/or using a different configuration for the process steps. In addition, process simulation software can provide a number of outputs regarding a process including the time used by all resources to execute specific activities, the overall cycle time of a process, the identification of resources that are infrequently used, and the bottlenecks in the process. Simulating a process is extremely valuable for process managers because it is a risk-free and inexpensive test of an improvement solution that does not need to be conducted with real resources.

- In the *improve phase*, the BPI team identifies possible solutions for addressing the root causes, maps the resulting “to be” process alternatives, and selects and implements the most appropriate solution. Common ways to improve processes are eliminating process activities that do not add value to the output and rearranging activities in a way that reduces delays or improves resource utilization. The organization must be careful, however, not to eliminate internal *process controls*—those activities that safeguard company resources, guarantee the accuracy of its financial reporting, and ensure adherence to rules and regulations.

- In the *control phase*, the team establishes process metrics and monitors the improved process after the solution has been implemented to ensure the process performance remains stable. An IS system can be very useful for this purpose.

Although BPI initiatives do not deliver the huge performance gains promised by BPR, many organizations prefer them because they are less risky and less costly. BPI focuses on delivering quantifiable results—and if a business case cannot be made, the project is not continued. All employees can be trained to apply BPI techniques in their own work to identify opportunities for improvement. Thus, BPI projects tend to be performed more from the bottom-up, in contrast to BPR projects, which involve top-down change mandates. BPI projects take less time overall, and even if they are unsuccessful, they consume fewer organizational resources than BPR projects. However, if incremental improvements through BPI are no longer possible, or if significant changes occur in the firm's business environment, then the firm should consider BPR projects. One final consideration is that over time, employees can become overstretched or lose interest if the company undertakes too many BPI projects and does not have an effective system to manage and focus the improvement efforts.

To sustain BPI efforts over time, organizations can adopt [business process management \(BPM\)](#), a management system that includes methods and tools to support the design, analysis, implementation, management, and continuous optimization of core business processes throughout the organization. BPM integrates disparate BPI initiatives to ensure consistent strategy execution.

Important components of BPM are process modeling, Web-enabled technologies, and business activity monitoring. BPM begins with *process modeling*, which is a graphical depiction of all of the steps in a process. Process modeling helps employees understand the interactions and dependencies among the people involved in the process, the information systems they rely on, and the information they require to optimally perform their tasks. Process modeling software can support this activity. IT's About Business [6.2](#) shows how Chevron has employed BPR, BPI, and BPM.

IT's About Business 6.2

BPR, BPI, and BPM at Chevron

Chevron (www.chevron.com), one of the world's largest oil and gas companies, and its subsidiaries are involved in exploring and producing oil and natural gas, as well as in manufacturing, transporting, and distributing petrochemical products, including gasoline and refined products. In 2013, Chevron employed more than 60,000 people worldwide,

produced the equivalent of more than 2.6 million barrels of oil every day, and garnered more than \$230 billion in sales. Chevron has initiated several process reengineering and improvement efforts over the years, evolving from BPR to BPI and eventually to BPM, as described below.

In 1995, Chevron's output was less than half of its current amount, producing roughly 1 million barrels of oil per day across six plants. The company had three major departments: Refining, Marketing, and Supply and Distribution (S&D). Management determined that they needed to improve their supply chain (see Chapter 11) to better integrate their multiple internal processes. A key figure in this initiative was Vice President Peter McCrea, who had a strong idea for dramatically improving performance. McCrea was convinced that Chevron had to reengineer the company's core processes from beginning to end: from the acquisition of crude oil to the distribution of final products to Chevron customers.

To accomplish this task, Chevron adopted a holistic approach. The company collaborated with a consulting firm to create a model of the existing processes. The objective was to radically improve these processes to align with Chevron's business goals. In other words, Chevron's strategy was not to concentrate on the existing processes to identify specific areas to improve. Rather, the project identified the desired outputs and then worked backward by examining the supporting processes, utilizing BPR. As an added benefit, this holistic approach led the company to examine the interdependencies among processes used in different business units. This approach ultimately improved the company's overall performance. In a 1996 report, Chevron claimed the BPR project saved the company \$50 million.

This complex BPR effort was initially followed by several smaller, employee-driven BPI initiatives. For example, in 1998, six Chevron employees initiated a project to improve water treatment processes at a company plant in California. Operating costs fell by one-third. Their success inspired other employees to initiate BPI projects in Indonesia, Angola, and other locations around the globe by using the Six Sigma improvement methodology. Although some managers were able to demonstrate the benefits of BPI at the local level, it wasn't until 2006 that these efforts achieved companywide recognition and corporate backing. In that year, Lean Six Sigma, which combines statistical process analysis with techniques to eliminate waste and improve process flow, became Chevron's preferred improvement methodology. Since Chevron implemented Lean Six Sigma, company employees have initiated hundreds of BPI projects worldwide, resulting in significant savings. From 2008 to 2010 alone, Chevron reported more than \$1 billion in BPI benefits.

To support these internal improvement efforts, Chevron got its suppliers on board in BPI initiatives as well.

To coordinate these various BPI efforts, Chevron has adopted a unified BPM approach that involves standardizing processes across the entire company and consolidating process information within a central repository. Chevron estimates that only 20 percent of its processes can be fully automated—the rest involve a combination of manual and automated steps. Thus, process standardization involves not only supporting activities that can be automated but also ensuring that relevant employees are familiar with the standards for manual activities. To familiarize employees with all these processes, Chevron implemented Nimbus (nimbus.tibco.com), a BPMS that acts as a repository of standard, companywide rules, and procedures. In addition, Nimbus can provide employees with detailed work instructions.

Take Chevron's shipping process as an example where the BPMS could shine. Shipping was executed in different ways in locations throughout Asia, Europe, and the United States. To establish uniform company standards, Chevron employed a BPI approach. The company documented its processes as they existed across different geographical locations, identified best practices, and combined these practices into a common process to implement. It then detailed these new policies and procedures, which it distributed to managers through the company's Web-based BPMS.

Chevron has a companywide management system that focuses on operational excellence, and BPM is a key part of that system. All Chevron operating companies and business units must implement continuous improvement, using carefully defined guidelines, metrics, and targets that are reviewed and adapted every year. Chevron's metrics focus on process efficiency, safety, risk, and the environment. The commitment to continuous improvement is part of Chevron's corporate culture. All employees participate in operational excellence activities, and managers receive specific operational excellence training.

Operational excellence is especially crucial when economic times are tough. For example, in the fourth quarter of 2014, Chevron's net income was \$3.5 billion, down nearly 30 percent from \$4.9 billion for the same period in 2013. This decline resulted primarily from the steep drop in crude oil prices. However, it's likely that results would have been worse without the operational excellence initiatives. Chevron's CEO noted that the lower crude oil prices were partially offset by increased operational efficiency in the company's downstream operations—that is, refining oil products and delivering them to customers. This increased efficiency was a product of the company's ongoing BPR, BPI, and BPM efforts.

Sources: Compiled from “Operational Excellence,” *chevron.com*, March 2012; “Chevron—Using Nimbus Control Software to Manage Processes,” *FindingPetroleum.com*, September 23, 2010; “Chevron Wins Boston Strategies International's 2010 Award for Lean Six Sigma Implementation in Oil and Gas Operations,” *www.bostonstrategies.com*, September 22, 2010; E. Schmidt, “From the Bottom Up: Grassroots Effort Finds Footing at Chevron,” *isixsigma.com*, March 1, 2010; R. Parker, “Business Process Improvement: A Talk with Chevron's Jim Boots,” *Ebizq.net*, August 26, 2009; P. Harmon, *Business Process Management*, Elsevier, Burlington, MA, 2007; *www.chevron.com*, accessed February 22, 2015.

Questions

1.

Describe the main advantages of BPR at Chevron.

2.

Why did Chevron adopt BPI?

3.

How does Chevron apply BPM in its operations today?

Web-enabled technologies display and retrieve data via a Web browser. They enable an organization to integrate the necessary people and applications into each process, across functional areas and geographical locations.

Finally, *business activity monitoring* (BAM) is a real-time approach for measuring and managing business processes. Companies use BAM to monitor their business processes, identify failures or exceptions, and address these failures in real time. Further, because BAM tracks process operations and indicates whether they succeed or fail, it creates valuable records of process behaviors that organizations can use to improve their processes.

BPM activities are often supported by *business process management suites* (BPMS). A BPMS is an integrated set of applications that includes a repository of process information, such as process maps and business rules; tools for process modeling, simulation, execution, coordination across functions, and re-configuration in response to changing business needs; as well as process-monitoring capabilities.

BPM is growing in business value. In 2012, Capgemini (*www.capgemini.com*), an international consulting firm, surveyed more than 1,000 senior business executives. The majority of the respondents indicated that BPM would play a more prominent role in their organizations in 2013 and 2014.

Further, Gartner (*www.gartner.com*), a leading IT research and advisory firm, stated that companies need to focus on developing and mastering BPM skills throughout the

organization. Gartner predicts that by 2016, high-performing companies will use BPM technologies such as real-time process monitoring, visualization, analytics, and intelligent automated decision making—all of them integrated in second-generation BPMS—to support intelligent business operations.

Another promising emerging trend is *social BPM*. This technology enables employees to collaborate, using social media tools on wired and mobile platforms, both internally across functions and externally with stakeholders (such as customers or experts), to exchange process knowledge and improve process execution.

BPM initially helps companies improve profitability by decreasing costs and increasing revenues. Over time, BPM can create a competitive advantage by improving organizational flexibility—making it easy to adapt to changing business conditions and to take advantage of new opportunities. For many companies, BPM can reduce costs, increase customer satisfaction, and ensure compliance with rules and regulations. In all cases, the company's strategy should drive the BPM effort. The following example illustrates these benefits.

Before you go on...

6.1

What is business process reengineering?

6.2

What is business process improvement?

6.3

What is business process management?

Apply the Concept6.2

LEARNING OBJECTIVE6.2

Compare and contrast business process reengineering and business process management to determine the advantages and disadvantages of each.

- **STEP 1 Background**

One of the most difficult decisions related to business processes is whether they need to be reengineered or simply managed. Reengineering business processes is a “clean slate” approach where you build completely new processes to accomplish current tasks. In contrast, managing these processes involves making current processes more efficient. Put simply, reengineering is radical, whereas management is incremental.

- **STEP 2 Activity**

Consider the many processes involved in getting you (as a student) accepted, enrolled, registered, housed, fed, and, ultimately, educated. Do you recall the processes you went through to accomplish these tasks? Did any of these processes strike you as inefficient?

- **STEP 3 Deliverable**

Imagine that you are a student representative on a committee whose task is to consider reengineering or modifying (managing) these business processes. Prepare a written statement for the committee that will compare and contrast BPR and BPM to determine the advantages and disadvantages of each strategy. Make a recommendation as to which one your university should follow and present your recommendation to your instructor.

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- **Discuss ways in which information systems enable cross-functional business processes and processes for a single functional area.**

A business process is an ongoing collection of related activities that produce a product or a service of value to the organization, its business partners, and/or its customers. Examples of business processes in the functional areas include managing accounts payable, managing accounts receivable, managing after-sale customer follow-up, managing bills of materials, managing manufacturing change orders, applying disability policies, employee hiring, computer user/staff training, and applying Internet use policy. The procurement and fulfillment processes are examples of cross-functional business processes.

- **2. Compare and contrast business process reengineering and business process management to determine the different advantages and disadvantages of each.**

Business process reengineering (BPR) is a radical redesign of business processes that is intended to improve the efficiency and effectiveness of an organization's business processes. The key to BPR is for enterprises to examine their business processes from a "clean sheet" perspective and then determine how they can best reconstruct those processes to improve their business functions. Because BPR proved difficult to implement, organizations have turned to business process management. Business process management (BPM) is a management technique that includes methods and tools to support the design, analysis, implementation, management, and optimization of business processes.

business process

A collection of related activities that create a product or a service of value to the organization, its business partners, and/or its customers.

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business process management

A management technique that includes methods and tools to support the design, analysis, implementation, management, and optimization of business processes.

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business process reengineering

A radical redesign of a business process that improves its efficiency and effectiveness, often by beginning with a “clean sheet” (i.e., from scratch).

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cross-functional processes

No single functional area is responsible for a process's execution.

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Business environment

The combination of social, legal, economic, physical, and political factors in which businesses conduct their operations.



Includes the producers, suppliers, distributors, and buyers, all with their value chains.



Business-information technology alignment



Value system

☐ Primary activities

☐ Globalization

2 of 21

The gap between those who have access to information and communications technology and those who do not.

☐ Entry barrier

☒ Digital divide

☐ Globalization

☐ Value chain



3 of 21

A management technique that includes methods and tools to support the design, analysis, implementation, management, and optimization of business processes.

☐ Business process

☒ Business process management

☐ Business process reengineering

☐ Cross-functional processes

A collection of related activities that create a product or a service of value to the organization, its business partners, and/or its customers.

☐ Business process

☐ Business process reengineering

☐ Cross-functional processes

☐ Business process management

Systems that help an organization gain a competitive advantage by supporting its strategic goals and/or increasing performance and productivity.

☐ Value chain model

☐ Business environment

☐ Entry barrier

☐ Strategic information systems (SISs)

Product or service feature that customers expect from organizations in a certain industry; an organization trying to enter this market must provide this product or service at a minimum to be able to compete.

☐ Business environment

☐ Digital divide

☒ Entry barrier

☐ Value chain model

7 of 21

A sequence of activities through which the organization's inputs, whatever they are, are transformed into more valuable outputs, whatever they are.

☐ Value chain model

☐ Strategic information systems (SISs)

☐ Business-information technology alignment

☒ Value chain

Model that shows the primary activities that sequentially add value to the profit margin; also shows the support activities.

- ☐ Value chain
- ☒ Value chain model
- ☐ Business-information technology alignment
- ☐ Primary activities

Efforts by organizations to solve various social problems.

- ☐ Support activities
- ☐ Competitive forces model
- ☐ Individual social responsibility

☐ Organizational social responsibility (also individual social responsibility)

10 of 21

The combination of social, legal, economic, physical, and political factors in which businesses conduct their operations.

☐ Competitive forces model

☐ Mass customization

☐ Business environment

☐ Value system

11 of 21

A production process in which items are produced in large quantities but are customized to fit the desires of each customer.

☐ Make-to-order

☐ Competitive forces model

☐ Globalization

☒ Mass customization

12 of 21

Those business activities related to the production and distribution of the firm's products and services, thus creating value.

☐ Mass customization

☐ Globalization

☐ Business environment

☒ Primary activities

13 of 21

An advantage over competitors in some measure such as cost, quality, or speed; leads to control of a market and to larger-than-average profits.

☐ Strategic information systems (SISs)

☐ Globalization

☐ Mass customization

☒ Competitive advantage

14 of 21

The strategy of producing customized products and services.

☐ Value chain model

☒ Make-to-order

☐ Primary activities

☐ Individual social responsibility



15 of 21

A radical redesign of a business process that improves its efficiency and effectiveness, often by beginning with a "clean sheet" (i.e., from scratch).

☒ Business process reengineering

☐ Business process

☐ Cross-functional processes

☐ Business process management

16 of 21

The integration and interdependence of economic, social, cultural, and ecological facets of life, enabled by rapid advances in information technology.

☐ Business-information technology alignment

☐ Value chain

☐ Primary activities

☒ Globalization

A business framework devised by Michael Porter that analyzes competitiveness by recognizing five major forces that could endanger a company's position.

- ☐ Individual social responsibility
- ☒ Competitive forces model
- ☐ Business-information technology alignment
- ☒ Value chain.

Efforts by organizations to solve various social problems.

- ☐ Strategic information systems (SISs)
- ☒ Individual social responsibility or Organizational social responsibility
- ☐ Value chain model

☐ Value system

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No single functional area is responsible for a process's execution.

☒ Cross-functional processes

☐ Business process management

☐ Business process reengineering

☐ Business process

20 of 21

The tight integration of the IT function with the strategy, mission, and goals of the organization.

☐ Digital divide

☐ Value chain model

☐ Business-information technology alignment

☐ Competitive forces model

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Business activities that do not add value directly to a firm's product or service under consideration but support the primary activities that do add value.

☐ Competitive advantage

☐ Value chain model

☐ Support activities

☐ Make-to-order

7.1 THE FUNCTIONAL ORGANIZATIONAL STRUCTURE

To successfully master the concepts in this textbook, you must first begin to think holistically about the operations of a business. The most common organizational structure you are likely to encounter is the **functional structure**. Organizations that utilize a functional structure are divided into functions, or departments, each of which is responsible for a set of closely related activities. For example, the accounting department sends and receives payments, and the warehouse receives and ships materials. Typical functions or departments found in a modern organization include *purchasing, operations, warehouse, sales and marketing, research and development, finance and accounting, human resources, and information systems*. The vertical columns in Figure 7.1 identify the key functions in a typical company.

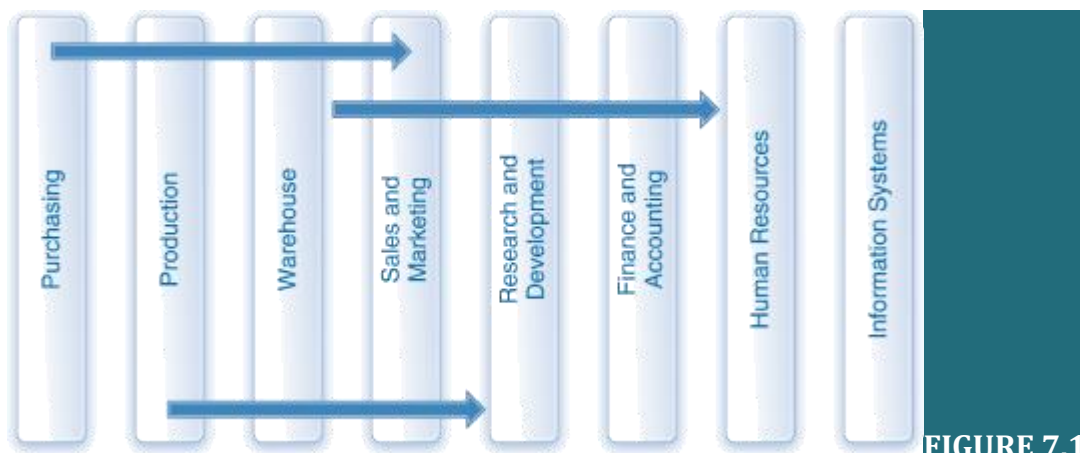


FIGURE 7.1 The

functional structure

Although most companies maintain vertical (or functional) silos to compartmentalize their operational units, the integrated business processes that companies use to perform their work cut across these silos horizontally. Business processes, such as the procurement and fulfillment processes discussed later in the chapter, consist of activities that occur in different, seemingly unrelated functions or departments. In other words, these processes are *cross-functional*, meaning no single group or function is responsible for their execution. Rather, it is a shared responsibility among many functional areas. The cross-functional nature of business processes is also illustrated in Figure 7.1. For a process to be successfully completed, then, the company must rely on each functional group to execute its individual steps in the process in a coordinated way, which, as we shall see, may not be an easy thing to accomplish.

THE SILO EFFECT

The functional structure served organizations well for a number of years because it enabled them to cope with the challenges generated by their rapid growth. Over time, however, this system developed a serious drawback. Put simply, people in the different functional areas came to perform their steps in the process in isolation, without fully understanding which steps happen before and which steps happen next. They essentially complete their part of the process, hand it off to the next person, and then proceed to the next task. By focusing so narrowly on their specific tasks, they lose sight of the “big picture” of the larger process, be it procurement, fulfillment, or any number of other common business processes. This tendency is commonly referred to as the **silos effect** because workers complete their tasks in their functional “silos” without regard to the consequences for the other components in the process.

A key point here is that the silo nature of the functional organizational structure and the cross-functional nature of processes are at odds with each other. That is, while workers focus on their specific function, each business process involves workers located in multiple functional areas. A major challenge facing organizations, then, is to coordinate activities among the different functional areas. Viewing a company from a process perspective requires employees to “think sideways”—in other words, to view the business across functional boundaries and focus on the end-to-end nature of the process and its intended outcomes. Learning to view a process from end to end is essential to understanding how enterprise systems help businesses manage their processes efficiently. Not surprisingly, then, this understanding has become a critical skill that companies have come to demand from their employees.

ENTERPRISE SYSTEMS

As you can see from the previous section, business processes span different parts of an organization. In fact, in today's global economy, the various process steps are increasingly executed by people in multiple locations throughout the world. That is, a company will manufacture its products in different countries, acquire the materials to make these products from different locations, sell the products in many countries, and so on. For example, a bicycle manufacturer may purchase components from Italy, produce bicycles in Germany, and sell those bicycles in the United States. Because the steps in business processes are performed in locations that are geographically dispersed, it is impossible to manage such processes effectively without the use of modern information systems.

Systems that support end-to-end processes are called **enterprise systems (ES)**, and they are essential to the efficient and effective execution and management of business process.

Given the significant impact that enterprise systems have on operational efficiency (and, ultimately, profitability), companies have invested enormous sums of capital and effort to plan, implement, and continuously improve enterprise systems over the past 40-plus years. A great deal of research has confirmed that investments in information technology (IT), particularly enterprise systems, have significantly increased the profitability, productivity, and competitiveness of corporations by removing the barriers to sharing information between functional areas and managing processes holistically.¹² The key driver for this productivity and efficiency is the ability of modern enterprise systems to effectively manage a business process from beginning to end in an integrated, consistent, and highly efficient manner. Further, once a business process is managed by an integrated enterprise system, it can be monitored and improved very easily. As a result, we cannot discuss contemporary business processes without considering the role of enterprise systems. We will discuss enterprise systems in greater depth in Chapter 8.

In this chapter, we begin by identifying the key processes that typically exist in organizations. We then discuss enterprise systems and SAP, the company that produces the most popular enterprise systems globally. We also introduce Global Bike Incorporated, a company that we will use as a case study throughout this textbook to illustrate important concepts in a practical format. We conclude with the plan for the remainder of the book.

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7.2 BUSINESS PROCESSES

Organizations exist either to serve some commercial purpose or to achieve some social objective. They differ depending on the purpose or goal they are trying to achieve, their ownership or management structure, and the regulatory environment in which they operate. Some organizations create and deliver products or services to customers to make a profit. For example, a bicycle manufacturer produces a variety of bicycles and accessories. It then sells these products to numerous retailers who, in turn, sell them to the final consumers. Other companies provide services, such as repairs to the bicycles. Yet others provide the manufacturer with the parts and materials needed to make the bicycles. Achieving the organization's objectives involves many different types of work. For example, the manufacturer must design the bicycles, identify what parts it will use to make them,

determine where to obtain these parts, produce the bicycles, identify its customers, and market and sell the bicycles to them. In addition, it must determine how to manage its money, its various facilities such as factories and warehouses, and the many people that it must recruit, employ, train, and retain. This work is completed in numerous processes.

Although organizations exist for many different purposes, vary greatly in size and complexity, and operate in many different industries, they all exhibit similarities in the ways that they operate. Regardless of their type or size, successful organizations and industries use *processes* and *enterprise systems* to complete the work needed to achieve their goals. Processes may vary slightly depending on the unique characteristics of the industry or the structure of the organization, but the basic activities can be recognized by anyone who has developed a process view of business. Likewise, companies may employ different enterprise systems to manage their processes. However, you can apply the principles, concepts, and techniques explained in this textbook to most of the enterprise systems you are likely to work with.

A **business process**, illustrated in Figure 7.2, is a set of tasks or activities that produce desired outcomes. Every process is triggered by some event, such as receiving a customer order or recognizing the need to increase inventory. The columns in the figure represent different parts, or functional areas, within an organization, such as sales, warehouse, manufacturing, and accounting. Thus, the specific steps in the process are completed in different functional areas. For example, when a retailer (customer) places an order for bicycles, the manufacturer (seller) uses a specific process to ensure that the correct products are shipped to the customer in a timely manner and that payment for the order is received. These process steps can include validating the order, preparing the shipment, sending the shipment, issuing an invoice, and recording the receipt of payment. The sales department receives and validates the customer order and passes it on to the warehouse, which prepares and ships the order. The accounting department handles the invoice and payment steps. This is a very simplistic example. However, it highlights the fact that processes consist of interdependent steps that are completed in different parts of the organization.

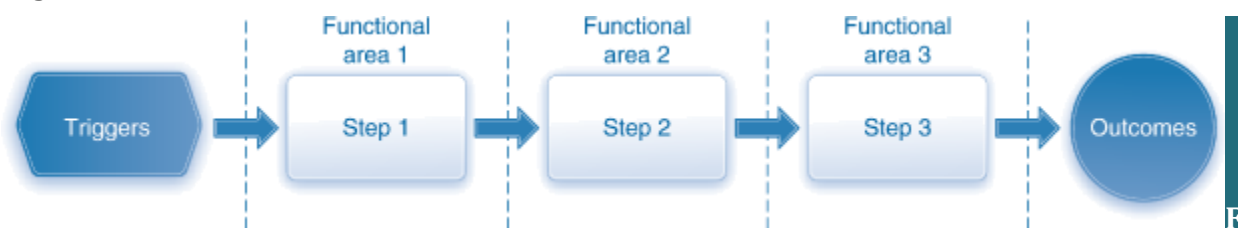


FIGURE 7.2 A generic business process

Because the various process steps are carried out by different functional areas or departments, effective communication and collaboration among the departments is essential to the smooth execution of these processes. Without this interaction, the process cannot be completed efficiently and effectively. For instance, if the customer order is not properly communicated to the warehouse, then it cannot be shipped on time. Similarly, if the order and shipment information is not communicated to the accounting department, billing and payment will not be completed efficiently and accurately. Clearly, completing a process successfully requires more than just communicating information. Close coordination of work among the people involved is also essential. For example, when the salesperson accepts the order, he or she must collaborate with the warehouse to determine when the order can be shipped. Without this collaboration, the salesperson may make promises that the company cannot realistically meet. If this occurs, then, the products will not be available when promised. The salesperson must also collaborate with the accounting department to verify that the customer is credit-worthy. Accepting orders and shipping goods to customers who have not made payments for previous shipments can cause major financial problems for the organization.

An organization uses many processes to achieve its objectives, as illustrated in Figure 7.3. Three processes are directly related to creating and delivering products and services. They are *buy*, *make*, and *sell*. Organizations use specific terms to identify these processes.

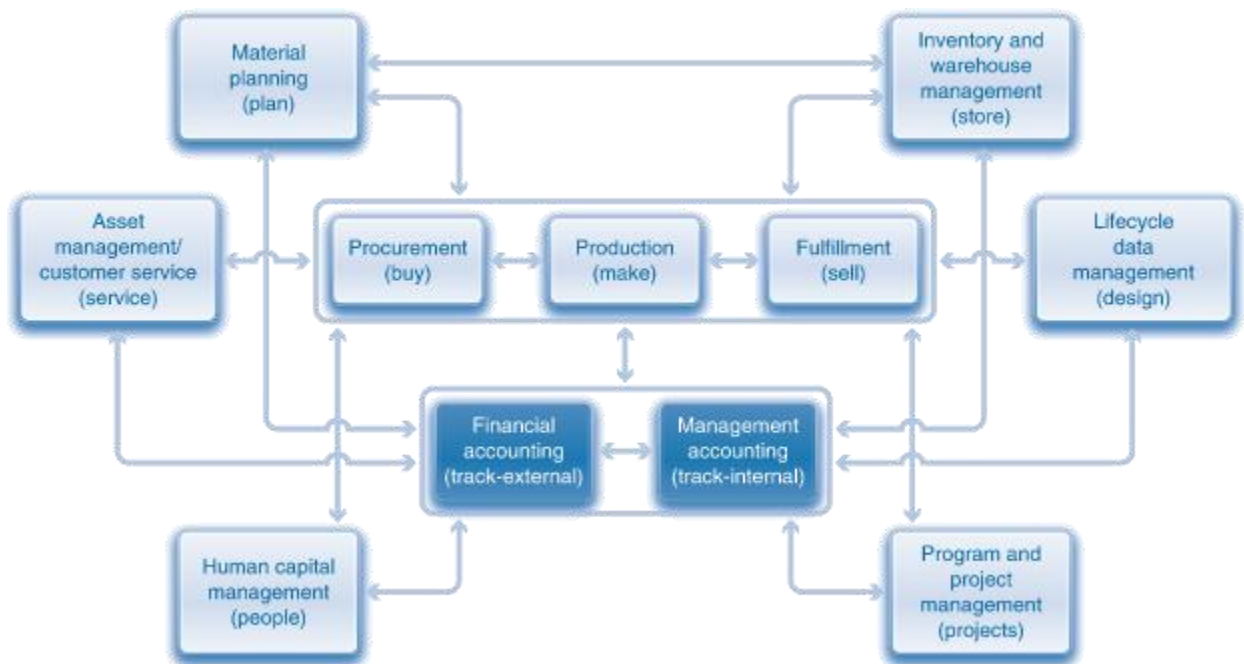


FIGURE 7.3 Key business processes

- The **procurement process** (*buy*) refers to all of the activities involved in buying or acquiring the materials used by the organization, such as raw materials needed to make products.
- The **production process** (*make*) involves the actual creation of the products within the organization. Whereas the production process is concerned with acquiring needed materials *internally* (by making them), the procurement process is concerned with obtaining needed materials *externally* (by buying them). Each is appropriate for different types of materials, as we will discuss later in the book.
- Finally, the **fulfillment process** (*sell*) consists of all the steps involved in selling and delivering the products to the organization's customers.

Closely related to buying, making, and selling are four processes used to *design, plan, store, and service* products. Once again, organizations use specific terms for these processes.

- The **lifecycle data management process** (*design*) supports the design and development of products from the initial product idea stage through the discontinuation of the product.
- The **material planning process** (*plan*) uses historical data and sales forecasts to plan which materials will be procured and produced and in what quantities.
- The **inventory and warehouse management (IWM) process** (*store*) is used to store and track the materials.
- The **asset management and customer service processes** (*service*) are used to maintain internal assets such as machinery and to deliver after-sales customer service such as repairs.

Going further, two support processes are related to *people* and *projects*.

- **Human capital management (HCM) processes** (*people*) focus on the people within the organization and include functions such as recruiting, hiring, training, and benefits management.
- **Project management processes** (*projects*) are used to plan and execute large projects such as the construction of a new factory or the production of complex products such as airplanes.

All these processes have an impact on an organization's *finance*. This brings us to the last two processes, which *track* the financial impacts of processes.

- **Financial accounting (FI) processes** (*track-external*) track the financial impacts of process steps with the goal of meeting legal reporting requirements—for example, the Internal Revenue Service (IRS) or the Securities and Exchange Commission (SEC).

- **Management accounting or controlling (CO) processes** (*track-internal*) focus on internal reporting to manage costs and revenues.

Each of these processes can include numerous subprocesses. For example, each of the components of HCM, such as recruiting and benefits management, is itself a process. Similarly, IWM can include complex processes for receiving materials from a vendor and shipping products to a customer. In addition, each process can impact other processes, as illustrated by the arrows between the processes in Figure 7.3. These arrows represent process integration. For example, the procurement of raw materials has an impact on what can be produced and when. Similarly, the production process has an impact on what goods are available to sell and when. Going further, the arrows indicate that all processes have an impact on the organization's financials, a concept we explore throughout this book.

Clearly, then, in addition to understanding the details of how each process works, it is essential to understand the interrelationships among the processes. Significantly, to prevent Figure 7.3 from becoming cluttered with arrows, we did not include every possible integration point. Instead, we highlighted only the key points.

In the next section, we briefly describe the various business processes. We subsequently consider each process at length in separate chapters, where we also examine the linkages among the processes.

PROCUREMENT—BUY

The procurement process includes all of the tasks involved in *acquiring needed materials externally* from a vendor. A very simple example of a procurement process is diagrammed in Figure 7.4. As the figure illustrates, procurement is comprised of five steps that are completed in three different functional areas of the organization.



FIGURE 7.4 A procurement process

The process begins when the warehouse recognizes the need to procure materials, perhaps due to low levels of inventory. The warehouse then documents this need in the form of a purchase requisition, which it sends to the purchasing department. In turn, the purchasing department identifies a suitable vendor, creates a purchase order, and sends it to the

vendor. The vendor ships the materials, which are received in the warehouse. The vendor then sends an invoice, which is received by the accounting department. Accounting then sends payment to the vendor, thereby completing the process.

In the preceding discussion a low inventory of materials was the trigger for the process. This discussion illustrates the link between procurement and the inventory and warehouse management process illustrated in Figure 7.3. Figure 7.3 shows, however, that procurement could be triggered by activity in other processes as well. The figure suggests at least three alternative scenarios.

- 1.The material planning process could indicate that the company needs to procure materials based on a forecasted demand for products.
- 2.The asset management or customer service process could trigger the procurement of a part needed to repair a machine or a product previously purchased by a customer.
- 3.A customer order (fulfillment process) could trigger the need to buy something, such as raw materials or component parts needed to manufacture the product.

PRODUCTION—MAKE

In the preceding discussion the company met the need that triggered the process via external procurement; that is, it purchased the needed materials from a vendor. Other times, however, a company uses the production process to *acquire needed materials internally*. As we explained in the previous paragraph, a customer order can trigger the production process. Alternatively, the material planning process can trigger in-house production. Figure 7.5 illustrates the case where the warehouse notices that its inventory of products is low. Subsequently, it will request production. In turn, the production department will approve the request. The approval authorizes the warehouse to release the materials needed to complete production. Once the production department has completed its task, the warehouse places the finished goods into storage. Note that this last step in the production process, which is concerned with the storage of the finished goods, could trigger IWM processes.



FIGURE 7.5 A production process

FULFILLMENT—SELL

Fulfillment (Figure 7.6) is concerned with *efficiently processing customer orders*. It is triggered by a customer purchase order that is received by the sales department. Sales then validates the order and creates a sales order. The sales order communicates data related to the order to other parts of the organization, and it tracks the progress of the order. The warehouse prepares and sends the shipment to the customer. Once accounting is notified of the shipment, it creates an invoice and sends it to the customer. The customer then makes a payment, which accounting records.



FIGURE 7.6 A fulfillment process

As this scenario illustrates, fulfillment triggers processes in IWM where the materials are stored. Of course, in many cases the ordered materials are not available in the warehouse. In such cases fulfillment will trigger external procurement and/or production.

MATERIAL PLANNING—PLAN

The term **material** encompasses all the products, components, parts, and so on that an organization uses. Businesses use and produce many types of materials. For example, material planning in a bicycle manufacturer would include: (a) *finished goods*, such as bicycles, that are sold to customers; (b) *semifinished goods*, such as wheel assemblies, that are used to make the finished goods; and (c) *raw materials*, such as the tires, tubes, and

wheels that are used to make the wheel assemblies. We examine the major *material types* in greater detail in Chapter 8.

The purpose of material planning is to *match the supply of materials with the demand*. The demand for finished goods is based on external factors such as customer tastes and preferences, economic conditions, and competitors' actions. The demand for the other materials is dependent on the demand for finished goods. Consequently, organizations use different data and processes to plan for different types of materials.

The supply of materials is a function of many internal and external factors. For example, the supply of materials procured externally (e.g., raw materials) depends on availability from vendors as well as the *lead time*, which is the time between placing the order and receiving the shipment. Internally, the supply depends on available production capacity in the factories.

The outcome of material planning is the development of strategic and operational plans that match supply with demand as closely as possible. Excess supply will result in increased inventory costs, which are the expenses associated with storing materials. Insufficient supply will result in a situation called *stock-out* in which the company cannot meet its customers' demands. Both situations can undermine a company's productivity and profits.

Material planning is influenced by the fulfillment process, which provides sales data that companies use to forecast demand for finished goods. It is also influenced by procurement and production, which provide data on lead times and capacities, and by IWM, which provides data on material availability. In turn, material planning will trigger procurement and production processes to ensure that demand is met and IWM processes to ensure that materials are stored until needed.

INVENTORY AND WAREHOUSE MANAGEMENT—STORE

Inventory and warehouse management (IWM) is concerned with the *storage and movement* of materials. For a business to operate efficiently, it is essential that materials be stored so that they can be quickly and easily located when needed. This is especially true for large warehouses where thousands of different materials are stored in large quantities. In addition, companies must be able to move the materials quickly and efficiently to wherever they are needed.

Figure [7.7](#) depicts four scenarios related to material storage and movement. Quadrant A (top left) shows a request for materials that will be used in the production process. These materials must be located and then issued to the production floor. In Quadrant B, the warehouse receives materials from the production process and then prepares them for

storage. This process can include such steps as sorting and determining an appropriate storage location. Finally, the materials are moved into the selected locations. A similar process is used for materials that are received from a vendor via the procurement process (Quadrant C). Finally, when a customer order is processed by the fulfillment process, the warehouse must locate the materials and prepare and send shipments to the customer (Quadrant D).

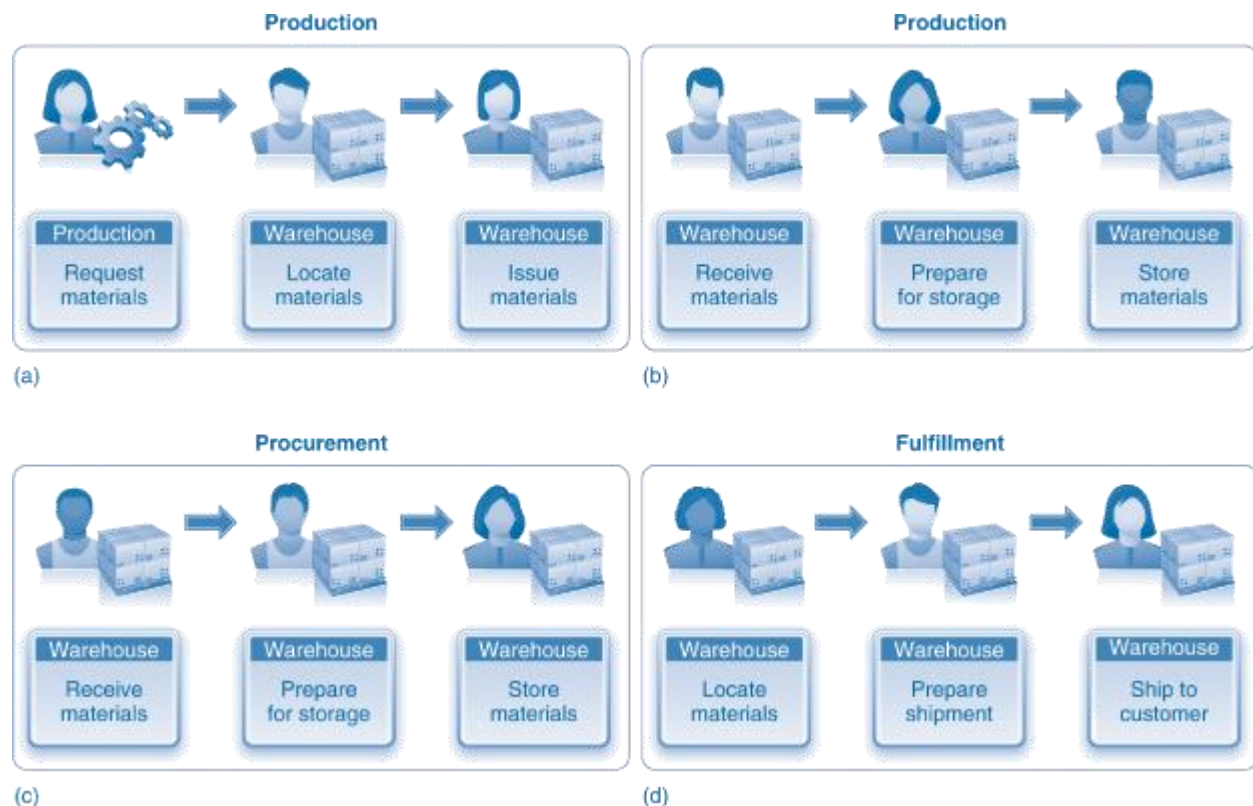


FIGURE 7.7 Inventory and warehouse management processes

These examples also clearly illustrate the integration between IWM and procurement, production, and fulfillment. We will discuss integration points with other processes in later chapters.

LIFECYCLE DATA MANAGEMENT—DESIGN

A successful organization must constantly improve its products and create new and innovative products that reflect changes in customer tastes and preferences. Lifecycle data management provides a set of tools to *manage product design and improvement* throughout the lifecycle of a product. The product lifecycle begins with idea or concept development; progresses through production, marketing, and service; and concludes when the product is discontinued from the market. It can range from a few months for fad items to many years or even decades for products such as automobiles and bicycles. Products in the latter

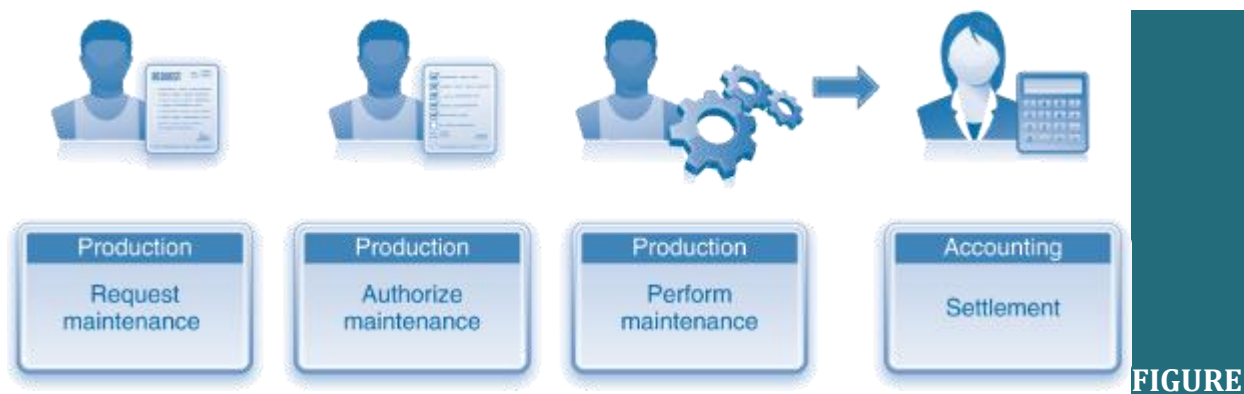
category typically undergo small but continual improvements over the course of their lifecycle.

Lifecycle data management enables an organization to optimize its product development process, from design to market, while ensuring that it complies with industry, quality, and regulatory standards. At the same time, it provides users—that is, the organization's employees—with access to product data at any point in the product's lifecycle. This capability, in turn, enables the organization to react more quickly to take advantage of market and competitive opportunities.

ASSET MANAGEMENT AND CUSTOMER SERVICE—SERVICE

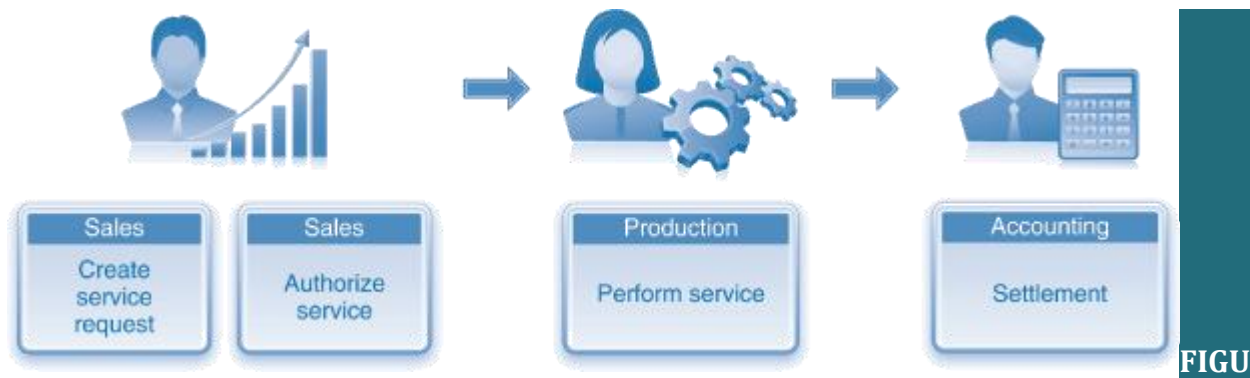
Asset management is concerned with both the preventive and corrective maintenance of an organization's equipment. *Preventive maintenance* is performed periodically—for example, the routine maintenance of a machine in a factory. In contrast, *corrective maintenance* is done as needed—for example, repairing a machine when it breaks down.

Figure 7.8 illustrates a simplified maintenance process. The trigger is a maintenance request, which can be either preventive or corrective. Production approves the request, and the maintenance is performed. The final stage, settlement, involves an internal charge for the work done.



7.8 An asset management process

A similar process is used for service requests from customers, for example, to *repair a product* they purchased (Figure 7.9). In such cases, different functional areas may be involved. Sales receives a service request, which it approves and forwards to the department responsible for completing the repairs. Settlement will depend on whether the service is covered by a warranty. If it is, then the organization will absorb the cost of the repair. Otherwise, the organization will send an invoice to the customer and then record payment, similar to the steps in the fulfillment process.



RE 7.9 A customer service process

HUMAN CAPITAL MANAGEMENT—PEOPLE

Human capital management (HCM) consists of numerous processes related to all aspects of *managing people* in an organization. Examples of HCM processes are *recruitment, hiring, training, compensation and benefits management, and payroll administration*. In our brief discussion of processes in this chapter, we focused on tasks and the functional areas where they are completed. Clearly, however, it is the people in the functional areas who actually perform the tasks. Consequently, HCM touches every process in the organization.

Moreover, it is not uncommon for people in different functional areas to complete many of the tasks in HCM processes. For example, the trigger for recruitment and hiring is a need for people with the requisite skills to complete process tasks. Consequently, the functional area in need of new employees will be involved in this process.

PROJECT MANAGEMENT—PROJECTS

Most business processes are ongoing or repetitive. For example, the lifecycle data management process spans the life of a product, and the procurement and fulfillment processes are repeated frequently. In contrast, a **project** is temporary in nature and is typically associated with large, complex activities, such as the construction of a factory or an aircraft. As we discussed earlier, project management refers to the processes a company uses to *plan and execute large-scale projects*. It involves the use of tools and techniques for managing complex projects.

Projects can be internal or external depending on the recipient of the final outcome. For internal projects, such as constructing a plant, project management is concerned primarily with costs. This is because the outcome of the project benefits the organization and is not sold to a customer. Because no sales are involved, no revenues are created. In contrast, external projects such as building an aircraft for a customer generate both costs and revenues.

Projects rely on resources and capabilities available in other processes. For example, building an aircraft involves purchasing materials (procurement process), making components from these materials (production), supervising people (HCM), and so on. External projects are also integrated with selling to customers (fulfillment). Figure 7.10 illustrates a simplified project management process. The diagram does not identify the specific functional areas in which the work needed to complete the project is performed because this will vary depending on which other processes are involved.



FIGURE 7.10 A project management process

In the planning phase the scope of the project is defined, and the milestones and deadlines are set. The budgeting phase triggers the accounting processes to calculate and allocate the resources needed to execute the project. The project is not executed until management approves the budget. During the execution phase the needed processes (e.g., procurement and production) are triggered. In addition, accounting processes are used to keep track of costs and revenues and, for external projects, to issue customer invoices. Finally, throughout the life of the project and at the end of the project an accounting process called *settlement* is periodically carried out to assign costs and revenues to the appropriate parties.

FINANCIAL ACCOUNTING—TRACK FOR EXTERNAL REPORTING

Financial accounting is concerned with *tracking the financial impacts of processes* with the primary goal of meeting legal and regulatory reporting requirements. Thus, it is externally focused. Common reports include the income statement or profit and loss (P&L) statement and the balance sheet. The income statement indicates the organization's financial condition within a specified period of time. It identifies revenues, expenses, and net profit (or loss) for the period. In contrast, a balance sheet indicates the financial condition of an organization at a given point in time. It identifies assets, liabilities, and shareholders'

equity. All of these reports must comply with prescribed standards, such as the generally accepted accounting principles (GAAP) in the United States and Handelsgesetzbuch (HGB) in Germany. These reports must be submitted to regulatory agencies at prescribed times, such as annually or quarterly. Finally, these reports are country specific. Therefore, an enterprise that operates in multiple countries must track financial data separately for each country, using that country's prescribed standards.

Various steps in the different processes introduced earlier in this chapter have an impact on an organization's financial status. Organizations analyze this impact using four key processes based in financial accounting: general ledger, accounts receivable, accounts payable, and asset accounting. The *general ledger* process records the impacts of various process steps on a company's financial position. The impacts are recorded in a number of *accounts* in the *general ledger* that represent an organization's income, expenses, assets, and liabilities. These accounts are used to store accounting-relevant data from process steps. *Accounts payable* is associated with the procurement process and is used to track money that is owed to vendors. Similarly, *accounts receivable* is used to track money owed by customers. Accounts receivable and accounts payable automate the general ledger entries associated with the procurement and fulfillment processes so that the financial impact of these processes is recorded automatically. Finally, *asset accounting* is concerned with tracking financial data related to assets such as machinery and cars.

MANAGEMENT ACCOUNTING—TRACK FOR INTERNAL REPORTING

Whereas financial accounting is concerned with external reporting that is mandated by laws and regulations, **management accounting**, or **controlling**, is concerned with *tracking costs and revenues* for internal reporting that is intended to help management control costs and revenues and assess the profitability of various products and market segments. Management creates these reports to support its decision making. Unlike financial accounting reports, management accounting reports are produced as needed and can contain any information that management deems necessary.

Among the major costs management accounting tracks are materials costs, labor costs, and overhead costs. Management takes these costs into account when it establishes prices for its products or services. It then combines these data with information concerning revenues to determine the profitability of various products and services in different market segments. Ultimately, management utilizes all of this information to make key strategic

decisions that affect the organization's products market mix as well as tactical decisions that influence day-to-day operations.



[Video Example Skullcandy - Success Beyond Adrenaline](#)
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7.3 *GLOBAL BIKE INCORPORATED (GBI)*

Throughout this book, we will use the case of *Global Bike Incorporated (GBI)* to illustrate important concepts, processes, and techniques. GBI is a fictional company, and its operations have been greatly simplified to make its business processes and its SAP ERP system easier for you to work with. Although GBI might seem complex as you progress through the chapters of this textbook, rarely will the business operations of a real-world company be as simple as those found in GBI.

Much the data used in this textbook are based on GBI and represent the many aspects of its fictional suppliers, customers, employees, and materials. In addition, all of the hands-on exercises are intended to be completed in a functioning (live) SAP ERP system that is configured with GBI data. (Enterprise Resource Planning, or ERP, systems integrate a company's various functional and cross-functional business processes. We explain ERP systems in greater detail in Chapter 8.) It is very important that you quickly become familiar with GBI and their business operations in order to master the key concepts in this course and to complete your course assignments.

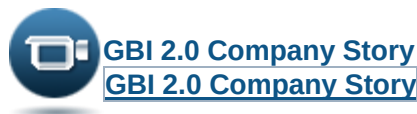
The following paragraphs provide a brief overview of GBI. However, you must retrieve the detailed GBI Annual Report from the *WileyPLUS* course site (explained later) or the *SAP University Alliances Community* (SAP UAC) at <http://uac.sap.com> to learn the full story of how GBI came into existence and to familiarize yourself with the specifics of the company's operations. The SAP UAC is a free site for all university students who are enrolled in an SAP course. The registration process is very simple and is free. In addition to the detailed GBI information on the SAP UAC site, you will also gain access to several SAP career services, including certification information and internship and job opportunities. Your instructor can show you where to access the GBI Annual Report on the SAP UAC site once you have registered.

GBI was founded in 2001 following the merger of two bicycle manufacturers, one based in the United States and the other in Germany. GBI has three lines of business: deluxe and professional touring bikes, men's and women's off-road bikes, and bike accessories. GBI sells its bikes to a network of specialized dealers throughout the world, and it procures its raw materials from a variety of suppliers globally.

GBI has two manufacturing facilities, one in the United States and one in Germany. It also has three additional warehouses, two in the United States and one in Germany. GBI has more than 100 employees globally. The organization uses SAP ERP to support its processes. Figure 7.11 illustrates GBI's enterprise structure.



FIGURE 7.11 GBI enterprise structure



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7.4 HOW TO USE THIS BOOK

This edition of *Integrated Business Processes with ERP Systems* does not cover all of the processes introduced in this chapter. Chapter 8 address the key logistics processes: procurement, fulfillment, production, warehouse management, and material planning. Finally, a concluding chapter discusses all of these processes from an integrated

perspective. In addition, the exercises and demonstrations included in this book are available online via *WileyPLUS*.

CHAPTER STRUCTURE

As the previous paragraph indicates, most chapters will focus on a specific process, such as procurement, financial accounting, and production. Most of these chapters share a common structure. Each chapter begins with a review of the simple presentation of the process introduced earlier in this chapter. The chapter then segues to a detailed discussion of data, key concepts, and process steps. General concepts related to data—*organizational data*, *master data*, and *transaction data*—will be introduced in Chapter 8. Each subsequent chapter will focus on the specific concepts and data that are relevant to the process discussed in that chapter. Most chapters require you to understand a few fundamental concepts, which are discussed next. Note that many of the concepts related to organizational and master data are relevant to more than one process. In such cases, we do not repeat the discussion of these concepts. Rather, we refer you to previous chapters where they were discussed.

The third main component of each chapter consists of a detailed discussion of the various steps involved in the process. Each process step will be discussed using the following framework:

- Triggers: the event(s) that cause(s) the process step to be initiated
- Tasks: the specific steps needed to complete the process step
- Data: the information associated with each process step
- Outcomes: the specific products or consequences of the process step

The fourth component of each chapter is reporting. This section examines how the data generated during the process steps are converted into meaningful information. It also provides examples of the types of reports that can help managers improve process performance.

Going further, each chapter employs three pedagogical tools—demonstrations, real-world cases, and exercises—to reinforce the material. Demonstrations illustrate either a particular concept or the execution of a process step in the SAP ERP system. These demonstrations are in the form of animations that can be viewed multiple times. Real-world cases are vignettes from actual companies that illustrate a concept or demonstrate how that company executes a process. Exercises to be completed in an SAP system configured with GBI data provide a final reinforcement of the chapter's key concepts.

SAP SOFTWARE

SAP (pronounced by saying each letter individually, like IBM or ABC) is the pioneer in enterprise systems. SAP was the first company to build a packaged enterprise system, which means that it designed a single piece of software that is used by many companies. Prior to that time, software developers had to create customized software for every company, which was prohibitively expensive.

SAP introduced the first integrated, end-to-end enterprise system, called SAP® R/3, in 1992. The “R” in R/3 stands for “real time.” Prior to the development of enterprise systems, companies typically employed a number of different systems, each of which supported a single function or department. Thus, there were sales systems, accounting systems, manufacturing systems, and so on. These systems were not integrated, so sharing data between and among them was problematic. As you might expect, this architecture regularly experienced delays in executing business processes because data had to be transferred from one system to the next as the process was being performed.

SAP R/3 was designed to eliminate these inefficiencies by executing an entire process from start to finish and consolidating all of the process data in a *single database*. Consequently, regardless of which individuals were completing a step in the process, all of the data were available to them in real time. In addition, everyone else in the company could see the status of the process in real time as well. In today's age of Twitter and RSS feeds, this development might seem trivial. At the time, however, it was a crucial innovation. SAP R/3 was quickly adopted by one major corporation after another, and it catapulted SAP software onto the “must do” list for nearly every large company. By 2010, SAP had more than 110,000 customers in over 120 countries, including nearly every Fortune 1000 company. In 2008, SAP's market share in the ERP category was equivalent to the market share of the next four largest ERP vendors—combined.^{3,4} Today, more than 75% of SAP's customers are small and medium-sized businesses. Enterprises of every size, in every industry, all over the world use SAP software to manage their business operations. Regardless of where you live, nearly every major corporation, government entity, and nonprofit organization you are familiar with runs the same SAP software that you will use in this course.

Before you start to think that this book is a marketing brochure for SAP, you should understand why we have explained SAP's strategic importance in business and have selected SAP ERP as the reference system for this textbook. One of the most lucrative and rewarding careers in the IT industry for nearly 20 years has been that of an SAP consultant.⁵ Contrary to what you may have heard, most SAP consultants are *not* programmers. Rather, they are MIS and business majors who have developed a process perspective on business and have become competent in a specific capability of the

SAP ERP system. However, even technical programmers who wish to work with SAP must have a deep understanding of how business works in order to program applications that enable business processes to operate more efficiently. In other words, they are people just like you who have mastered the material in this textbook.

Integrated Business Processes with ERP Systems will incorporate a number of demonstrations, examples, and hands-on exercises using SAP ERP. Several other companies offer enterprise systems that have similar capabilities, but it would be very difficult to explain how processes are executed in each of them. We have chosen to include the most prevalent and widely used ERP system that you are likely to encounter in your career. Although some of the concepts in this textbook are specific to SAP ERP, you can easily transfer nearly everything you learn to whichever system is used in the companies where you will work.

When SAP first introduced R/3, almost anybody could claim to be an R/3 expert and thus become a highly paid consultant. Unfortunately, this practice led to quite a few well-publicized project failures. In response, SAP introduced *certifications* for the various modules and technical skills required to be a properly trained consultant. This arrangement enabled consultants who participated in SAP training programs and demonstrated a high degree of skill to distinguish themselves for potential employers. Today, SAP provides more than 100 certification types, classified by solution, focus area, and role. Each certification type specifies three levels of skill: associate, professional, and master. It can take many years and tens of thousands of dollars to progress up to master-level certification. SAP is very proud of the high level of knowledge and skills that are required to earn certification. As you probably suspect by now, the SAP testing process is extremely rigorous. Because an SAP certification is such a highly valued credential, once you have earned one, SAP provides you with a certification number that can be listed on your resume or CV and verified by potential employers—the thousands of consulting companies that implement SAP software and the more than 110,000 (in 2010) companies that run SAP software.

As an added benefit to students enrolled at universities or technical schools that are members of the SAP University Alliances Program, SAP offers special certification academies on campuses around the world where students can earn the same certification as professionals at a reduced cost. This textbook and the additional online materials are based on the content in the SAP course, which results in an official SAP Associate Application Consultant certification and can be used as a supplement to the SAP course materials. Alternatively, students who master the concepts in this textbook and the

additional online materials can take the SAP certification exam at one of over 8,000 global testing centers without participating in a certification academy.

Students who pass the exam will receive the same official SAP certification as working professionals who complete an SAP-sponsored training program. Earning this certification is the first step toward a successful and perhaps lucrative career as an SAP application consultant. Speak with your instructor, and consult the certification information on the SAP University Alliances Community and *WileyPLUS* for more details.



[Video Example High-Tech Help for Haiti](#)
[Video Example High-Tech Help for Haiti](#)

WILEYPLUS

WileyPLUS is an important online supplement to this book. It includes four key components: hands-on exercises, SAP ERP system demonstrations, online chapters, and information about preparing for the SAP certification exam.

The hands-on exercises found on the *WileyPLUS* companion site for this textbook will guide you through the execution of the process steps found in each chapter. You will complete these exercises in a live SAP ERP system based on Global Bike, Inc., which you will become very familiar with throughout the chapters. In essence, you will assume the role of the various employees of GBI and complete their tasks in the SAP ERP system, as if you were doing their job. In this way, you will see the processes executed from multiple viewpoints and thus further develop your “process perspective” of the firm. Your instructor will provide you with login information and the SAP interface to complete these exercises in the SAP ERP system. We anticipate that you will encounter some difficulties while completing the exercises. Nearly every student does, so don't become discouraged if this happens to you. Your instructor or lab assistant can provide some help if you are working in an on-campus lab. You can also seek help from fellow students in your class. One of the most valuable sources of assistance is the SAP University Alliances (SAP UAC) discussion forum for this textbook. Go to www.extrabandwidth.com/forum, which will redirect you to the SAP UAC forum, where you can ask questions about the text and the exercises. Students and professors around the world will quickly assist you. If you receive a helpful answer, you can award points to the person who helped you. Not only is this a nice form of recognition, but it helps the community reinforce its focus on mutual support and knowledge sharing.

Throughout each chapter you will see references to demonstrations that will illustrate how a particular concept, task, or data is presented in the SAP system. These

demonstrations are meant to enhance your conceptual understanding of the topic by providing you with a visual and physical representation of how the system executes or displays a particular component of the process being discussed. We advise you to follow the demonstrations on the *WileyPLUS* website while reading and reviewing the chapter in the printed textbook. For the online version of the textbook on *WileyPLUS*, the demonstrations are linked directly from the references in the chapter for easy access. Going further, the demonstrations are very similar to the activities required in the exercises. Therefore, it will be helpful to review the demonstrations prior to attempting the exercises so as to familiarize yourself with the navigation, key data, and activities required to complete the process steps.

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CHAPTER SUMMARY

This chapter introduced the key concepts related to common business processes in organizations, the typical functional structure that companies employ to manage their operations, and the benefits of adopting a holistic view of integrated business processes and their role in effectively translating corporate strategy into operational efficiency.

Most companies are organized according to functional departments, which group together related activities and assets under specialized management controls. Although this approach enables companies to focus resources on specific activities, it also creates communication difficulties and delays between the highly specialized groups. Business processes cut across the vertical barriers (silos) that characterize the functional structure. For this reason they require cross-functional communication and collaborative execution.

Enterprise systems allow companies to effectively manage business processes across functional areas and institutional boundaries. They perform this task by removing barriers to sharing and accessing information, thereby providing a holistic platform to execute integrated business processes consistently and efficiently. One of the key benefits to managing business processes with an integrated enterprise system is that process data are collected throughout the execution of each step of the process. Managers can then use these data to monitor and improve the organization's processes. Enterprise systems enable companies to achieve operational efficiency through transparency across functional areas, and they provide consistent information for managerial decision making. All business processes have an impact on the organization's financial status, and the real-time impact of

process execution can be monitored and analyzed through the use of an integrated enterprise system.

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8.1 *ENTERPRISE SYSTEMS*

Enterprise systems are one of the most complex and powerful information systems in use today. As we explained in Chapter 7, this book will cover the world's most popular ES—SAP ERP—in great depth. Although you might have studied enterprise systems in a previous course, we provide a quick review of the key concepts to refresh your knowledge and to place these concepts in an appropriate context for the rest of this course. In this section we briefly discuss the architecture of enterprise systems, the SAP® Business Suite, SAP ERP, and the technology platform—SAP® Netweaver—that forms the foundation for these applications.

ARCHITECTURE OF ENTERPRISE SYSTEMS

The **architecture** of an enterprise system refers to the technical structure of the software, the ways that users interact with the software, and the ways the software is physically managed on computer hardware. Most modern ES have either a three-tier client-server architecture or a service-oriented architecture. There are many different ways to deploy ES in these two architectures. Both models offer distinctive technical and cost benefits, and both models have drawbacks. Nevertheless, the impact of these two models on the

management of business processes is largely the same. We examine both types of architecture below.

Client-Server Architecture

Think of a desktop application that you routinely use, such as word processing, spreadsheet, or presentation software. These applications consist of three components, or *layers*: (1) how you interact with the application (using menus, typing, and selecting); (2) what the application allows you to do (create formulas or charts, compose an essay); and (3) where the application stores your work (on your hard drive or flash drive). These layers are the **presentation layer**, **application layer**, and **data layer**, respectively. In the desktop applications mentioned above, all three layers are contained in one system. In contrast, the **three-tier client-server architecture** separates these layers into three separate systems, as illustrated in Figure 8.1.

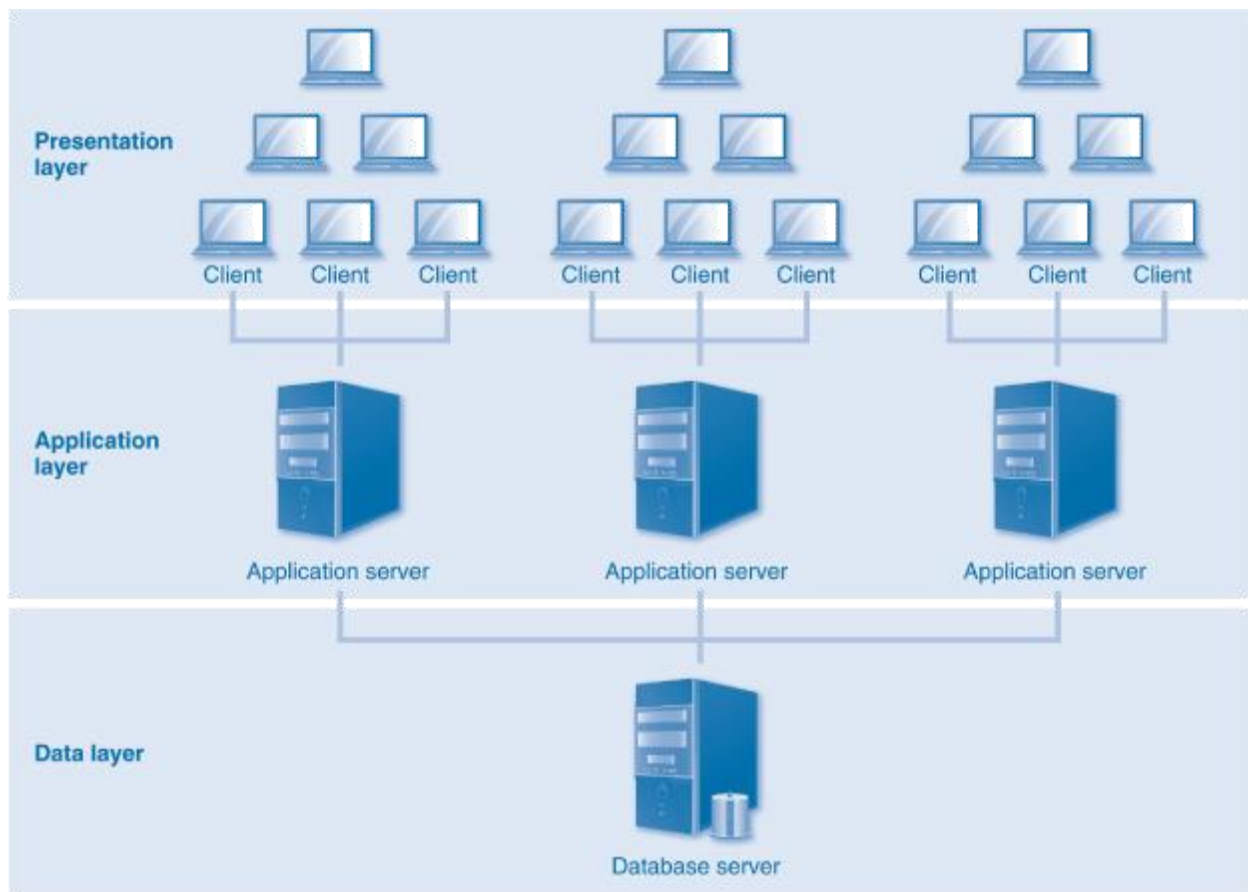


FIGURE 8.1 Three layers of the client-server architecture

Much of the work you do on the Internet uses a three-tier architecture. Your browser is the presentation layer. Through your browser, you connect to many systems (websites) that provide a variety of capabilities (e-mail, purchasing goods, information sharing). These

websites contain the applications that execute the request you send through the browser (via HTTP), and they retrieve and store data in a connected database.

The shift to the three-tier client-server architecture dramatically reduced the costs of acquiring, implementing, and using an ES while significantly increasing the scalability of the systems. *Scalability* refers to the ability of the hardware and software to support a greater number of users easily over time, typically at a decreasing cost per user. These two benefits transformed ES from a capability that only a few large companies could afford into a technology that tens of thousands of companies now utilize.

Service-Oriented Architecture

In the early 2000s, companies began to Web-enable their three-tier applications so that users could access the systems through a Web browser. During these years companies also benefited from new technologies that could help link, or *integrate*, many different client-server systems together in new and valuable ways. These new technologies are collectively labeled **service-oriented architecture**, or SOA. The fundamental concept behind SOA relates to the technical capabilities that allow systems to connect with one another through standardized interfaces called *Web services*. By using Web services, companies could now integrate multiple client-server applications and create enterprise *mash-ups*, or *composite applications*. Composite applications and mash-ups rely on Web services to send and receive data between and among ES in a standardized way, which eliminates a great deal of cost and complexity from integration projects. In addition, they execute newer and more specific processes than are typically found in the standard ES.

Companies such as SAP have invested billions of dollars to service-enable their applications so that these systems can be exposed—that is, their functionality can be made visible to users—and can be connected to a great number of composite applications. By using SOA to integrate and expose the business processes and data inside an ES, companies can now create new composite applications quickly and inexpensively. In essence, SOA enables companies to build composite applications on top of their existing three-tier client-server applications without changing the underlying applications. This capability gives companies an entirely new level of flexibility at an extremely low cost.

ENTERPRISE RESOURCE PLANNING (ERP) SYSTEMS

Enterprise resource planning (ERP) systems are the world's largest and most complex ES. ERP systems focus primarily on *intra-company processes*—that is, the operations that are performed within an organization—and they integrate functional and cross-functional business processes. Typical ERP systems support Operations (Production), Human Resources, Finance & Accounting, Sales & Distribution, and Procurement. As we discussed

in Chapter 7 shows the solution map for the current version of the system developed by SAP, known as SAP ERP.

Human Capital Management	Talent Management		Workforce Process Management		Workforce Deployment		Travel Management	
Financials	Financial Supply Chain Management		Treasury		Financial Accounting		Management Accounting	
Product Development & Collaboration	Product Development	Product Data Management	Product Intelligence		Product Compliance	Document Management	Tool and Workgroup Integration	
Procurement	Purchase Requisition Management	Operational Sourcing		Purchase Order Management		Contract Management		Invoice Management
Operations: Sales and Customer Service	Sales Order Management				Aftermarket Sales and Service			
Operations: Manufacturing	Production Planning		Manufacturing Execution			Manufacturing Collaboration		
Enterprise Asset Management	Investment Planning & Design	Procurement & Construction	Maintenance & Operations	Decommissioning & Disposal	Asset Analytics & Performance Optimization	Real Estate Management	Fleet Management	
Operations: Cross Functions	Quality Management	Environment, Health, and Safety Compliance Management	Inbound and Outbound Logistics	Inventory and Warehouse Management		Global Trade Services	Project and Portfolio Management	

SAP NetWeaver

Shared Service Delivery

FIGURE 8.2 The SAP ERP solution map. Copyright SAP AG 2011

The solution map identifies the functionality and processes supported by the system. Notice that many of the functional capabilities in the solution map are similar to the business processes that were defined in Chapter 7. In addition, several areas of SAP ERP overlap with functional groups within the company. These overlaps are a result of the tight integration of ERP and the processes that it manages. As companies have adopted more and more ERP capabilities and begun to view their companies from more of a process perspective, the ES world and the functional world have begun to merge. Given the scope and size of the SAP ERP system, we will focus on the core ERP functional modules in this book.

Although companies are moving toward a process view of organizations, and our book takes a process view of business operations, the functional view still persists in many organizations. The capabilities of an ERP system are often described in terms of modules or specific capabilities, and it is still quite common to see or hear SAP ERP referred to in terms of module abbreviations in job advertisements or industry discussions. Figure 8.3 lists the more common modules in SAP ERP and the abbreviations that are typically used for them. For example, a person with expertise in the financial accounting and management accounting modules of SAP ERP is typically called a FICO expert based on the abbreviations of the two modules.

• Production Planning (PP)	• Financial Accounting (FI)
• Materials Management (MM)	• Management Accounting / Controlling (CO)
• Sales and Distribution (SD)	• Human Resources (HR)
• Plant Maintenance (PM)	• Business Intelligence (BI)
• Project Systems (PS)	
• Quality Management (QM)	

FIGURE 8.3 SAP ERP

modules

As more companies acquired ERP systems, the next step in the evolution of ES was to connect these systems so they could support *inter-company processes*—that is, processes that take place between and among companies. Examples of inter-company systems are **supply chain management (SCM)** and **supplier relationship management (SRM)** systems, which connect a company's ERP system to those of its suppliers. SCM connects a company to other companies that supply the materials it needs to make its products. Typical SCM systems help companies plan for their production requirements and optimize complex transportation and logistics for materials. SRM systems typically manage the overall relationships with the materials suppliers. SRM systems contain functionality to manage the quotation and contracts processes. These systems act as extensions to the procurement and material planning processes of ERP systems.

On the other side of the manufacturing and sales processes, **customer relationship management (CRM)** systems connect a company's ERP system to those of its customers. CRM systems provide companies with capabilities to manage marketing, sales, and customer service. These systems are an extension of the fulfillment process of ERP systems. **Product lifecycle management (PLM)** systems help companies administer the processes of research, design, and product management. In effect, PLM systems help companies take new product ideas from the virtual drawing board all the way to the manufacturing facility.

The collection of these inter-company systems and the underlying intra-company ERP system is called an **application suite**. Suite vendors, such as SAP and Oracle, provide fairly comprehensive collections of applications that offer an enormous amount of functionality and cover most of the standard business processes.

Figure 8.4 identifies the various capabilities that are part of an application suite and illustrates how they connect to other members of a company's business network. It is important to note that one of the key benefits of utilizing a complete suite of software is that the data and processes are integrated among the systems in the suite. That is, although

they are separate systems, they are designed so that they work together in an integrated manner.



FIGURE 8.4 The ES application suite

The focus of this textbook is on core intra-company processes and ERP systems. Keep in mind, however, that the emergence of inter-company business capabilities is one of the most important developments in the modern business environment. A fundamental understanding of the key business processes and ERP systems is a prerequisite to studying advanced topics such as supply chain management and customer relationship management because those processes are extensions of the core ERP-enabled business processes.



[Video Example All About Sausage](#)
[Video Example All About Sausage](#)

APPLICATION PLATFORMS

Another critical component of ES is application platforms. Much like the role of the operating system for your personal computer, **application platforms** serve as a type of “enterprise operating system” for a company's ES landscape by allowing all of the various systems to communicate seamlessly with one another as well as with systems outside the company. SAP introduced its application platform, SAP NetWeaver, in 2003. SAP NetWeaver is now an integral part of SAP ERP and the SAP Business Suite. It contains the SOA capabilities needed to integrate SAP systems with non-SAP systems. In addition, it provides companies with a toolset to build new composite applications or to plug in independent software vendor (ISV) applications on top of their core ERP and suite applications. Figure [8.5](#) illustrates how SAP NetWeaver interacts with the SAP Business Suite of applications.

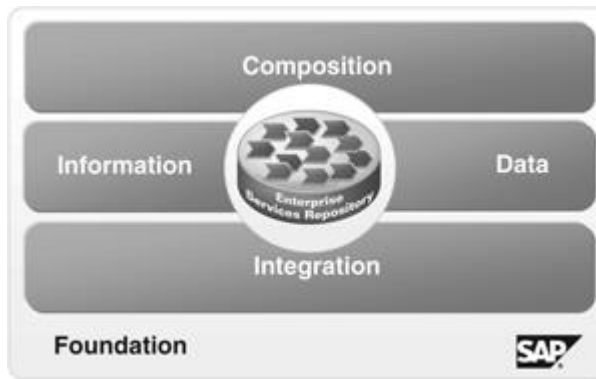


FIGURE 8.5 SAP NetWeaver. Copyright SAP AG

2011

The SAP Business Suite, which includes SAP ERP, SAP® CRM, SAP® SCM, SAP® PLM, and SAP® SRM, runs on SAP NetWeaver. You can think of the relationship between the SAP Business Suite and SAP NetWeaver in terms of the relationship between Microsoft Office and the Microsoft Windows operating system. The SAP Business Suite consists of the applications that companies use to manage and execute their business processes, just as Microsoft Office contains the applications that you use to accomplish tasks such as creating a presentation, a document, or a spreadsheet. SAP NetWeaver orchestrates the communication among the applications, transporting the master data and technical information needed by the applications at different points in the process. Similarly, Microsoft Windows is an operating system that the Microsoft Office applications use to communicate with one another and to access other capabilities and tools. SAP NetWeaver also contains several technical tools to help companies extend the SAP Business Suite applications, integrate with other non-SAP applications, and build (compose) new applications. In essence, SAP NetWeaver is the “operating system” for a company's entire range of business processes.

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8.2 DATA IN AN ENTERPRISE SYSTEM

As we discussed earlier, a central component of any ERP system is the common database that stores data related to all the processes. Without this function, integrating the various processes would be difficult, if not impossible. Therefore it is essential to understand how data are organized in an ERP system. We address this topic in the following section. We then introduce the different types of data that are stored in an ERP system, and we identify basic data elements that are common to many processes. We will develop these topics and

introduce additional data elements in later chapters that discuss specific processes. For the purposes of this chapter we will restrict our discussions to the procurement and fulfillment processes introduced in Chapter 7.

Data in an ERP system are used to represent the physical system in which process steps such as creating a purchase order and receiving goods are carried out. These steps generate data, which represent the outcomes of the steps. There are three types of data in an ERP system: organizational data, master data, and transaction data.

ORGANIZATIONAL DATA

Organizational data are used to represent the structure of an enterprise. Examples of organizational structure are companies, subsidiaries, factories, warehouses, storage areas, and sales regions. The three organizational data elements discussed in this chapter are client, company code, and plant (see Figure 8.6). Note that the terms *organizational data*, *organizational levels*, and *organizational elements* are often used interchangeably, depending on the context. These data are relevant to many of the processes discussed in Chapter 7. We will introduce additional organizational data as needed in the various process chapters.

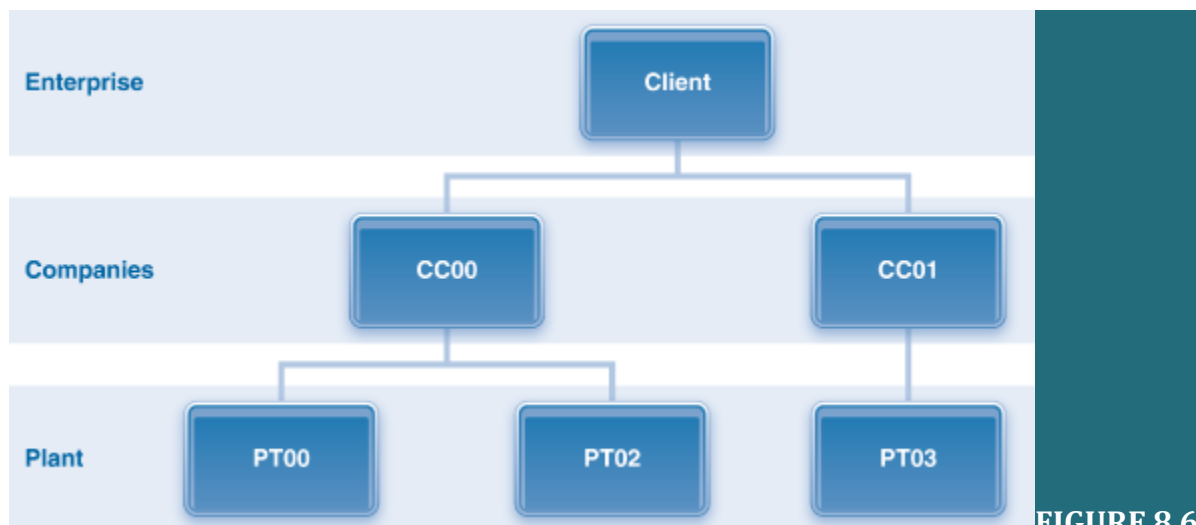


FIGURE 8.6 Org

anizational data

Client and Company Code

A **client** is the highest organizational level in SAP ERP. It represents an enterprise consisting of many companies or subsidiaries. Each company within the enterprise is represented by a **company code**. Each company code represents a separate legal entity, and it is the central organizational element in financial accounting. That is, financial statements required for legal reporting purposes are maintained at the company code level.

A client can have multiple company codes, but a company code must belong to only one client.

Figure 8.7 shows organizational data for GBI. Recall from Chapter 7 that GBI consists of two companies, one in the United States and one in Germany. GBI is represented by a client, and each of the two companies is represented by a company code, US00 and DE00, respectively.

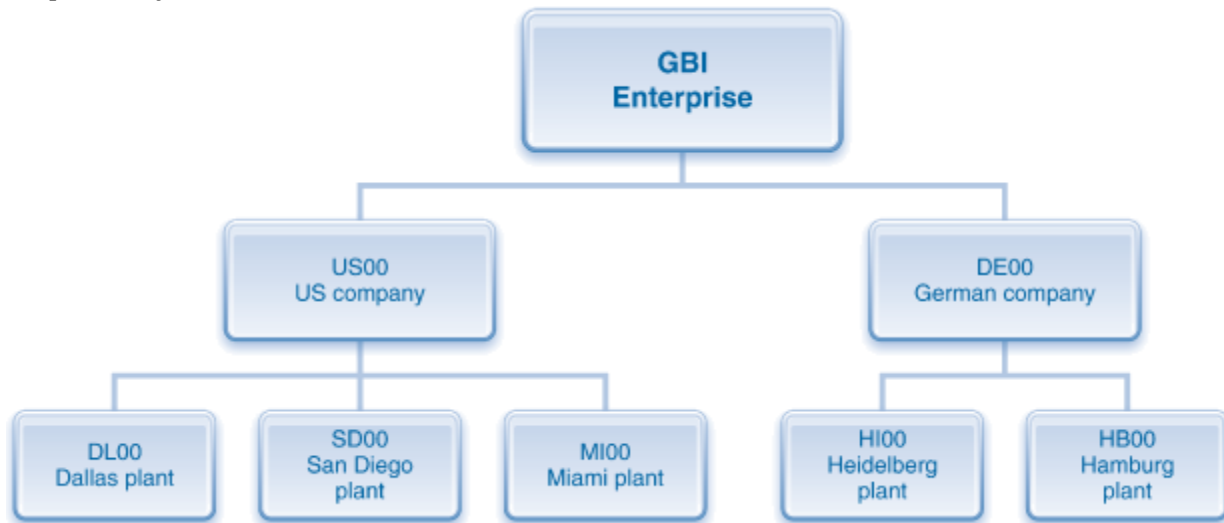


FIGURE 8.7 GBI organizational data

Plant

A **plant** is an organizational element that performs multiple functions and is relevant to several processes. It is essentially a facility in which the following functions are performed:

- Products and services are created.
- Materials are stored and used for distribution.
- Production planning is carried out.
- Service or maintenance is performed.

A plant can be a factory, a warehouse, a regional distribution center, a service center, or an office. It can be a part of a building, an entire building, or a collection of buildings. In addition, a single building can house multiple plants. Consider, for example, a company that has several offices in a building. Different services or activities, such as processing customer returns and providing technical support to customers, are performed in these offices. Each of these offices is defined as a separate plant. Just as a client can have multiple company codes, a company code can contain multiple plants. However, a plant can belong to only one company code.

As illustrated in Figure 8.7, GBI operates five plants for the manufacture and storage of bicycles and accessories. Three plants are located in the United States—in Dallas (DL00), San Diego (SD00), and Miami (MI00). The Dallas plant is a manufacturing facility, whereas

the other two are distribution centers from which products are shipped to customers. The Dallas plant ships products to customers as well. The other two plants are located in Germany—in Hamburg (HB00) and Heidelberg (HI00). The Heidelberg plant operates as both a manufacturing facility and a distribution center, while the Hamburg plant is exclusively a distribution center.

Business Processes in Practice8.1Coca-Cola®

Enterprises

Coca-Cola Enterprises provides us with a good example of a company that has several types of plants. Coca-Cola operates factories that produce both raw materials and finished goods. Some factories produce the syrup that forms the basis of the Coca-Cola products you are familiar with. Other factories combine the syrup with carbonated water during the bottling process to make the finished Coca-Cola products. The finished goods, which consist of cases of bottles and cans of Coca-Cola products, are then shipped to regional distribution centers for storage until they are transported to end customers, such as retailers. The syrup factory, the bottling factory, and the distribution center are all considered plants in Coca-Cola's SAP ERP system.

Source: Coca-Cola Company Reports & CCE CIO presentation at SAP Sapphire 2008.

MASTER DATA

Master data represent entities associated with various processes. For example, processes involve buying materials from vendors and selling materials to customers. In this example, customers, vendors, and materials are represented in an ERP system using master data.

The most commonly used master data in an organization is the material master. Materials are used in numerous processes. They are purchased, sold, produced, and planned for. They are used in maintenance and service, and in projects. Consequently, material master data are some of the most complex and extensively utilized data in an ERP system. In contrast, other master data are relevant only to certain processes. For example, vendor master data apply to procurement, and customer master data are utilized in fulfillment. This chapter will focus exclusively on material master data. We will consider other master data in the appropriate process chapters.

Material Master

Although materials are relevant to many processes, each process uses the materials differently. For example, the procurement process buys materials, the production process makes materials, and the fulfillment process sells materials. Each process, therefore,

requires data about the material that may or may not be needed by other processes. For example, the procurement process requires data concerning who is responsible for purchasing the material and how much should be ordered. Similarly, the fulfillment process utilizes data concerning product availability and shipping conditions.

It should be evident that because the material master is used in numerous processes, it must include a large amount of data. To manage these data, the material master groups them into different categories or *views*, each of which is relevant to one or more processes. Figure 8.8 illustrates the major views of data in the material master. Basic data, such as *material number*, *description*, and *weight*, are relevant to almost all processes. The other views are relevant only to certain processes. For example, purchasing data are relevant to the procurement process and sales data to the fulfillment process. The data in each of the views will be explained in detail in the appropriate process chapters.



FIGURE 8.8 Material master data

Material Types

Another factor that influences the type of data or view needed is the type of material. Materials are categorized into different **material types** based on the way they are used in the firm's operations. Each material type has different characteristics and is used for different purposes and in different ways. The material type determines which business processes are permitted to use the material. This, in turn, determines which types of data must be maintained for the material. Therefore, the data in the material master will vary for different types of materials. Specifically, material type determines, for example, the screens that appear in the material master record, the department or function-specific data that must be maintained, how the material numbers are determined, the appropriate

procurement types (in-house or external), and the general ledger accounts that need to be updated. Table [8.1](#) provides a list of commonly used material types.

Table 8.1

Material Type	Description
DIEN	Services
ERSA	Spare parts
FERT	Finished goods
FHMI	Production resources/tools
HALB	Semifinished goods
HAWA	Trading goods
HIBE	Operating supplies
IBAU	Maintenance assembly
KMAT	Configurable material
LEER	Empty containers
NLAG	Nonstock, nonvaluated material
PROD	Product group
ROH	Raw materials
UNBW	Nonvaluated, stocked material
VERP	Customer returnable packaging
WETT	Competitive products

The four most common material types are raw materials, semifinished goods, finished goods, and trading goods. We describe and discuss these material types below. The terms in parentheses following the names are the SAP ERP abbreviation for that material type. These abbreviations are based on the German term for each type. GBI's product structure (finished goods and trading goods) is presented in Figure [8.9](#). Table [8.2](#) lists GBI materials grouped by material type.

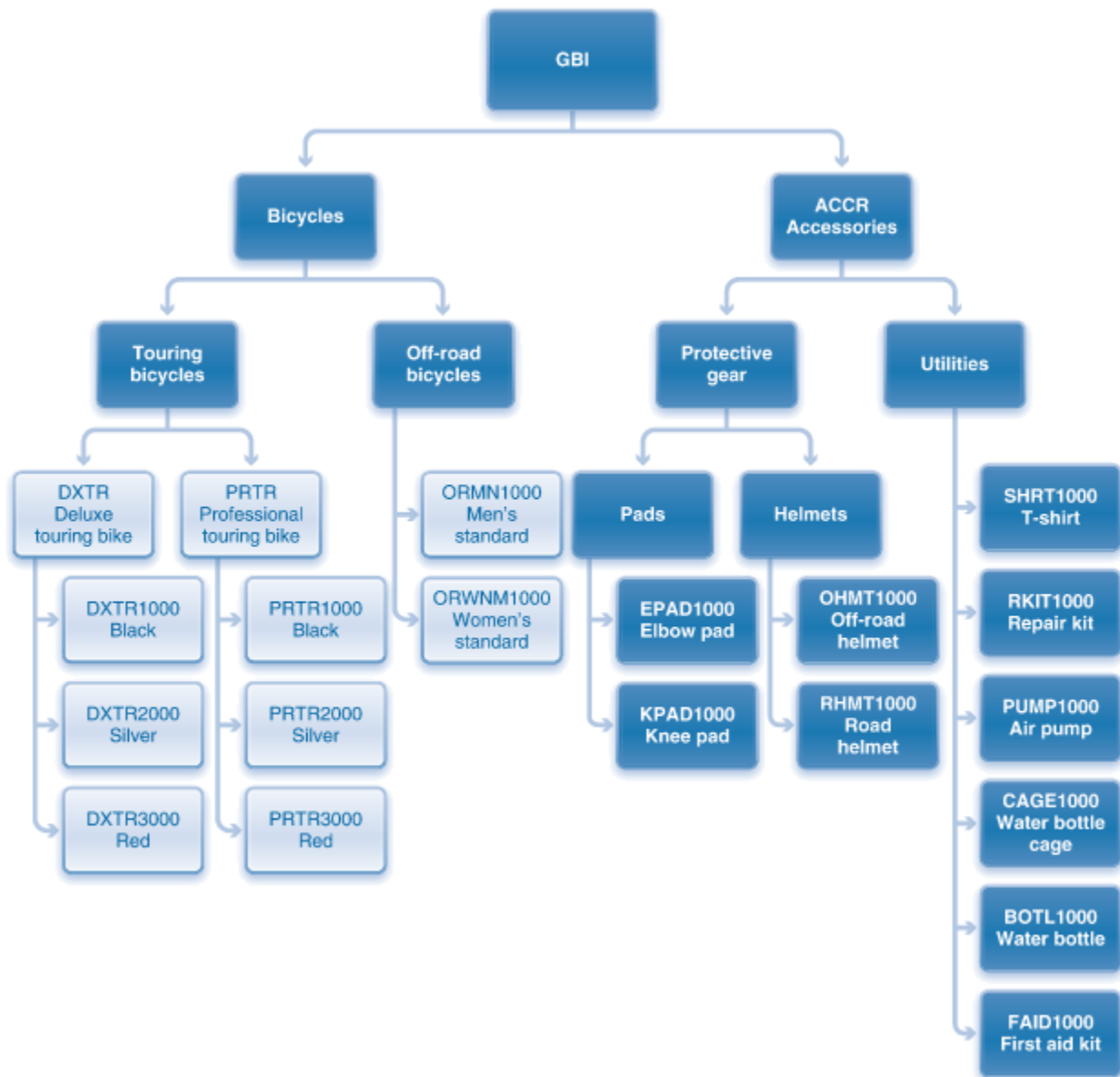


FIGURE 8.9 GBI product structure

- **Raw materials** (ROH) are purchased from an external source—a vendor—and used in the production process. Typically, raw materials are not sold to end-customers. Consequently, the material master will contain data related to procurement and production but not fulfillment. Examples of raw materials utilized by GBI are frames, wheels, tires, and tubes.
- **Semifinished goods** (HALB) are typically produced in-house from other materials (e.g., raw materials) and are used in the production of a finished good. Consequently, data related to production must be maintained for semifinished goods. Front wheel assemblies are an example of semifinished goods from GBI. GBI

purchases tires, wheels, and tubes and then uses these raw materials to create wheel assemblies.

- **Finished goods** (FERT) are created by the production process from other materials, such as raw materials and semifinished goods. They are generally not purchased. As a result, the material master for finished goods will include data related to production and fulfillment, but not procurement. An example of a finished good from GBI is the deluxe touring bicycle, which is produced from raw materials (e.g., frames) and semifinished goods (e.g., wheel assemblies).
- **Trading goods** (HAWA), like raw materials, are purchased from a vendor. Unlike raw materials, however, trading goods are resold to customers. Significantly, the company does not perform any additional processing of the material prior to reselling it. Therefore, the material master for trading goods will include data related to purchasing and selling but not production. An example of a trading good from GBI is a helmet. GBI simply purchases the helmets from a supplier and resells them to its customers; no other steps are involved.

Table 8.2

Raw Materials	Semifinished Goods	Finished Goods
• Derailleur gear assembly • Frame • Seat kit • Handle bar • Pedal assembly • Chain • Brake kit • Warranty document • Packaging • Tire • Tube • Wheel • Nuts and bolts	• Wheel assembly	• Deluxe touring bike (3 col • Professional touring bike • Men's standard off-road b • Women's standard off-roa

Material Groups

Related to material type is the concept of a **material group**, which includes materials with similar characteristics. For example, all of the materials used in the production of bicycles, such as tires and tubes—which are raw materials—and wheel assemblies—which are semifinished goods—can be included in one material group called *production*. As another example, all bicycles, which are generally finished goods but can also be trading goods, can be placed into one group called *sales*. Alternatively, bicycles can be grouped based on how they are used, such as *touring* and *off-road*. In the retail industry, material groups represent

merchandise categories such as footwear, clothes, and beverages. Materials are grouped so that they can be managed collectively. For example, planning for off-road bicycles is performed for all of the bikes in that material group rather than for individual bikes or brand names.

Organizational Level

A final factor that determines the type of data included in the material master is organizational level. Materials can be defined differently for different organizational levels. For example, the same material can be used in multiple plants, but the ways it is used can vary from one plant to another. If a company exports materials from only one of its plants, for instance, then data related to exporting that material must be included in the material's definition for that plant. These data are not necessary, however, for the other plants. As another example, GBI may choose not to ship bikes to customers from its Dallas plant. Rather, it sends the bikes to its two distribution centers (Miami or San Diego), which then ship them to customers. In this case, sales-related data for the bikes are included in the material master's definition for the Miami and San Diego plants but not for the Dallas plant.



[Demo 8.1: Review Material Types](#)

[Demo 8.1: Review Material Types](#)

[Demo 8.2: Review Material Master Data](#)

[Demo 8.2: Review Material Master Data](#)

TRANSACTION DATA

Processes are executed in the context of organizational levels, involve master data, and result in transaction data. **Transaction data** reflect the consequences of executing process steps, or *transactions*. Examples of transaction data are dates, quantities, prices, and payment and delivery terms. Thus, transaction data are a combination of organizational data, master data, and situational data—that is, data that are specific to the task being executed, such as who, what, when, and where. The composition of transaction data is illustrated in Figure [8.10](#).



FIGURE 8.10 Transaction data

SAP ERP uses several different types of documents to record transaction data. Some of these documents are created or utilized as the process is being executed; others record data after the process steps are completed. We refer to the first category as **transaction documents**. Examples are purchase orders, packing lists, and invoices. A purchase order communicates the company's order to its vendor. A packing list accompanies the shipment sent by the vendor, and an invoice is a request for payment for materials shipped.

Documents that record data generated after the process steps have been completed include **financial accounting [FI] documents**, **management accounting or controlling [CO] documents**, and **material documents**. These three documents are “virtual” documents in that they reside in the enterprise system and are printed only occasionally as needed. FI and CO documents record the financial impact of process steps. For example, when a company receives a payment from a customer, there is a financial impact, and an FI document is created. Material documents record materials movements, such as when materials are received from a vendor or shipped to a customer.

Documents typically consist of two sections, a *header* section and a *detail* or *line item* section. Figure 8.11 illustrates the concept of headers and items using an example of a purchase order, which is a type of transaction document. The top part of the document is the header. The three materials included in the purchase order—knee pads, elbow pads, and off-road helmets—are the line items. The header includes data such as purchase order number, date, and payment terms that are relevant to all line items, meaning that these data are relevant to the entire document. In contrast, the data in the line items, such as quantity and price, are specific to each item. A document can include multiple line items, as illustrated in the figure.

Global Bicycle Incorporated

5215 N. O'Conner Blvd.
Dallas, Texas, 75039
Phone: +1.972.555.2000 Fax: +1.972.555.2001

PURCHASE ORDER
Purchase Order Number: 4546

THE PURCHASE ORDER NUMBER MUST APPEAR ON ALL RELATED CORRESPONDENCE, SHIPPING PAPERS, AND INVOICES

TO:
Olympic Protective Gear
2100 Summit Boulevard
Atlanta, GA, 30319

SHIP TO:
GBI San Diego Distribution Center
150 Spear Street
San Diego, 94105
+1.415.555.7700

Purchase Order #	P.O. Date	Delivery Date	Shipped VIA	F.O.B. Point	Payment Terms
4546	July 11, 2009	July 27, 2009	Ground	Destination	Net 30

Quantity	Material #	Material Description	Unit Type	Unit Price	Item Total
100	KPAD1000	Knee Pads	Each	37.50	3,750.00
100	EPAD1000	Elbow Pads	Each	37.50	3,750.00
50	OHMT1000	Off-road Helmets	Each	25.00	1,250.00

SUBTOTAL					\$8,750.00
SALES TAX					Exempt
SHIPPING AND HANDLING					Included
OTHER					N/A
ORDER TOTAL					\$8,750.00

Authorized by: _____ Date: _____

Purchasing Manager

FIGURE 8.11 Purchase order



Demo 8.3: Review a Purchase Order
Demo 8.3: Review a Purchase Order

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8.3 REPORTING

As you have probably concluded from the discussions of master data, organizational data, and transaction data, enterprise systems produce and consume massive amounts of data in the day-to-day execution of business processes. In fact, it is not uncommon for companies to have several terabytes (trillions of bytes) of “live” data passing through their ERP systems on a weekly basis. More importantly, after data are no longer needed for process execution, they then become historical data and must be archived securely and made available for many types of data analysis. This process generates many more terabytes of historical data that are stored in complex data repositories called *data warehouses*. With such a massive volume of data to deal with, how can a company extract the meaningful information it needs to make better decisions and operate more efficiently?

At the most basic level, every enterprise system contains transaction and historical data in its main database. Transaction data relate to processes that are currently in use or have been completed recently, within days or weeks. Conversely, historical data are typically comprised of transaction data for processes that have been completed within months or years. **Reporting** is a general term used to describe the ways that users can view and analyze both transaction and historical data to help them make decisions and complete their tasks. Reporting capabilities range from simple lists of information for basic users to analytical tools that can perform powerful statistical analysis and advanced calculations to produce extremely detailed information for specialist users. The data used in the different types of reporting are the same, but the ways in which they are extracted, filtered, and presented differ greatly and involve varying levels of complexity and expertise, depending on how employees plan to use them.

SAP ERP provides two reporting options—simple *lists* of data and documents and *analytics*. Before we examine these options, however, we need to distinguish between the *transactional environment* and the *analytic environment* of SAP ERP (see Figure [8.12](#)). The transactional environment of SAP ERP is an **online transaction processing (OLTP)** system, which, as the name suggests, is designed to capture and store detailed transaction data. The primary function of OLTP is to execute process steps quickly and efficiently; it is optimized for this purpose. OLTP is not used to generate sophisticated reports because it lacks the computing power to parse through and analyze the vast stores of data that most companies accumulate. Consequently, businesses employ OLTP to generate only simple lists and reports.

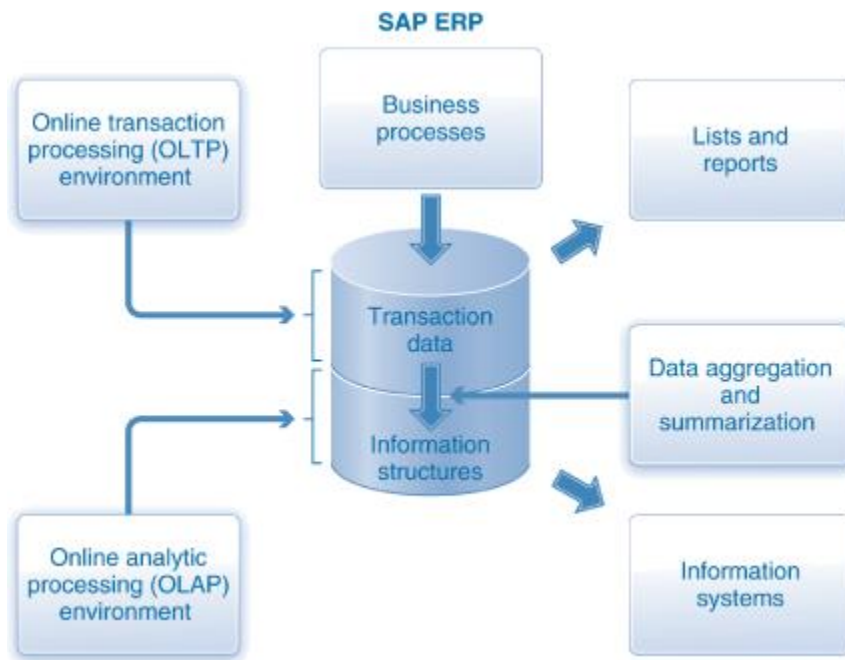


FIGURE 8.12 Reporting

options within SAP ERP

For detailed data analysis, SAP ERP includes an **online analytic processing (OLAP)** environment in the form of *information systems*. Instead of using detailed transaction data, these systems use information structures to provide analytic capabilities. **Information structures** capture and store specified transaction data in an aggregated and summarized form that enables users to analyze the data as needed. Each information structure in the OLAP environment is defined in terms of three features: characteristics, key figures, and period definition (Figure 8.13). **Characteristics** are the objects for which data are collected. These objects are typically organizational data such as plant and sales organization and master data such as materials, vendors, and customers. An information structure can include up to nine characteristics. **Key figures** are performance measures, such as quantities and counts that are associated with the characteristics. Examples are number of orders, quantities ordered, order value, and invoice amounts. Thus, instead of recording the details of orders and invoices, key figures maintain only statistical summaries, such as the total number of orders placed by a customer. This is one level of aggregation of transaction data, and it is *qualitative* in nature because the selection of key figures is subjective. Finally, data are collected or aggregated for specified time periods, such as daily, weekly, and monthly, which are specified in the **period definition**. In contrast to key figures, period definition represents a *quantitative* aggregation of data. Thus, information structures can be defined as aggregated and summarized forms of transaction data that are periodically updated.

Period	Characteristic		Key figures	
Date	Customer	Material	Sales quantity	Sales amount
5/12/09	Rocky Mountain Bikes	DXTR1000	23	\$64,400
5/19/09	Philly Bikes	PRTR1000	45	\$135,000
5/23/09	Beantown Bikes	DXTR1000	34	\$95,200
****	****	****	****	****

FIGURE 8.13 Components of information structures

ts of information structures

In sum, then, the OLTP environment provides reporting in the form of lists, and the OLAP environment provides reporting in the form of analytics via information systems. Going further, lists fall into two categories—work lists and online lists.

WORK LISTS

Work lists identify tasks that are scheduled to be completed in a process. In the fulfillment process, for example, once customer orders are recorded in the system by the salespersons, warehouse personnel can retrieve a list of orders that are ready for picking. Picking is the first step in preparing a shipment. It involves retrieving, or picking, materials from storage. A *picking due list* (Figure 8.14) identifies all customer orders that must be prepared for delivery so that they can be shipped in a timely manner. The user selects the appropriate data, such as shipping location, due dates, and other relevant parameters (see inset in Figure 8.14). The resulting work list shows three orders that must be picked to ensure that they will be delivered on time. The user will select one of the orders and complete the picking task.

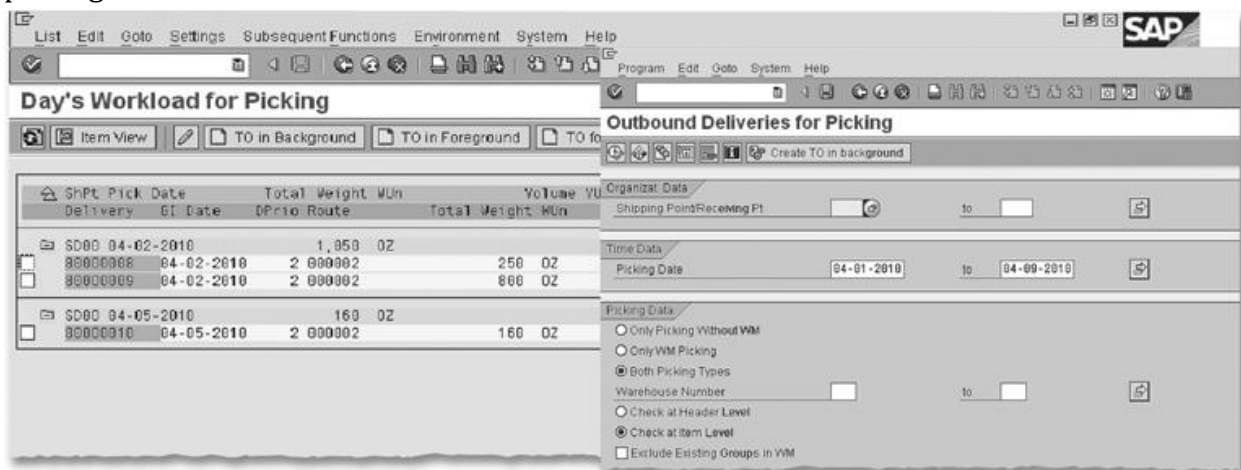


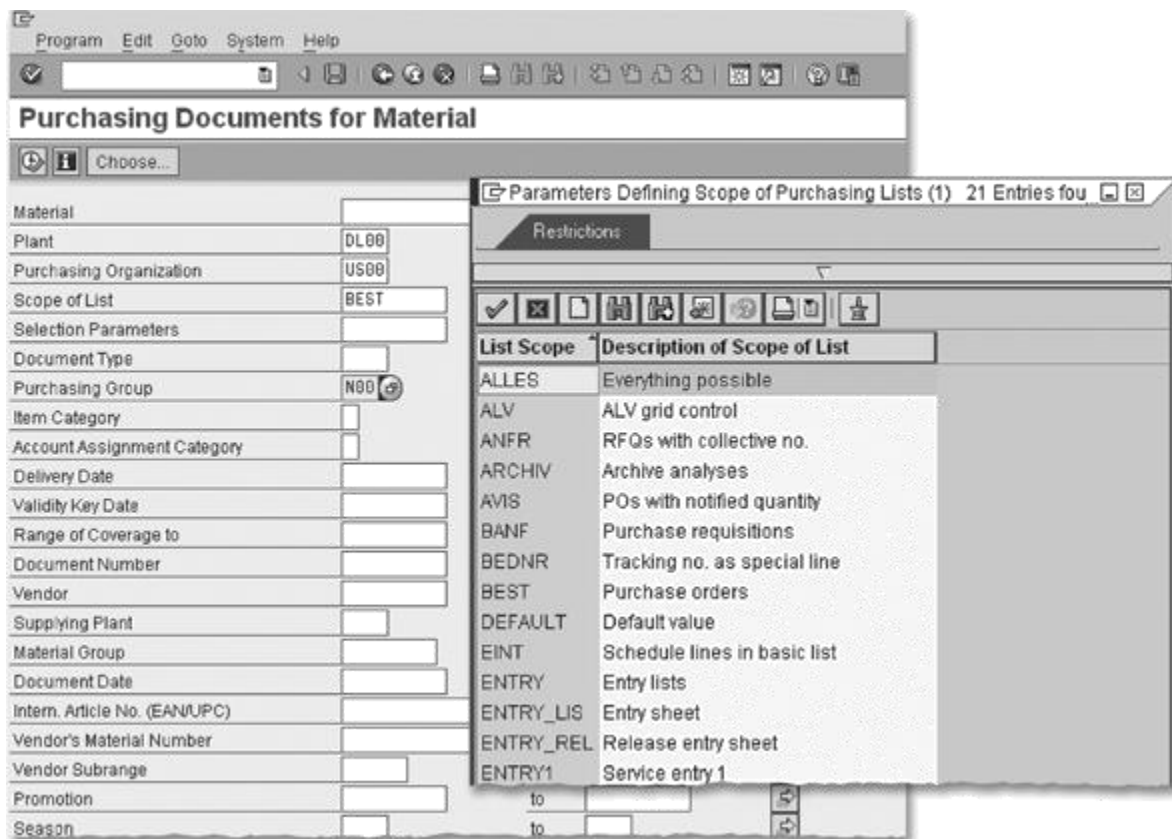
FIGURE 8.14 Work list—picking due list. Copyright SAP AG 2011



Demo 8.4: Review a Work List

ONLINE LISTS

Online lists display lists of master data—such as materials, vendors, and purchasing info records—and documents—such as transaction documents, FI, CO, and material documents—that are generated during the execution of a process. The content and appearance of these lists are defined using selection parameters and scope-of-list parameters. *Selection parameters* determine which documents will be included in the list, while the *scope-of-list parameters* define which data will be included for the selected documents. In addition, numerous other parameters such as dates, master data (e.g., vendors), and organizational data (e.g., plant) can be used to narrow the data in the report. Figure 8.15 shows the initial screen for the display of purchasing documents. The inset shows choices for the selection parameters.



FIG

URE 8.15 Online list—list display for documents. Copyright SAP AG 2011

Material	Plant	SLoc	MVT	S	Material Doc.	Item	Posting Date	Qty in Un.	of Entry	EUn
BOLT1001	DL00	RM00	261		4900000108	6	06/21/2010	20		EA
BOLT1001	DL00	RM00	561		4900000107	1	06/21/2010	20		EA
BOLT1003	DL00	RM00	561		4900000111	13	06/22/2010	20		EA
BOLT1003	DL00	RM00	261		4900000112	6	06/22/2010	20		EA
BRKT1003	DL00	RM00	561		4900000111	7	06/22/2010	10		EA
BRKT1003	DL00	RM00	261		4900000113	8	06/22/2010	10		EA
CHAN1003	DL00	RM00	561		4900000111	6	06/22/2010	10		EA
CHAN1003	DL00	RM00	261		4900000113	7	06/22/2010	10		EA
DGAM1003	DL00	RM00	561		4900000111	2	06/22/2010	10		EA
DGAM1003	DL00	RM00	261		4900000113	3	06/22/2010	10		EA
DGAM9999	DL00	RM00	561		4900000100	1	06/21/2010	5,000		EA
DXTR3003	DL00	FG00	101		5000000005	1	06/22/2010	10		EA
HXNT1001	DL00	RM00	261		4900000108	4	06/21/2010	20		EA
HXNT1001	DL00	RM00	561		4900000104	2	06/21/2010	20		EA
HXNT1001	DL00	RM00	561		4900000104	1	06/21/2010	20		EA
HXNT1003	DL00	RM00	261		4900000112	4	06/22/2010	20		EA
HXNT1003	DL00	RM00	561		4900000111	11	06/22/2010	20		EA

2011

FIGURE 8.17 On

line list—report using ALV grid control. Copyright SAP AG 2011

The list viewer and grid control provide several options for displaying the report output. These options are illustrated in Figure 8.18 and are explained as follows.

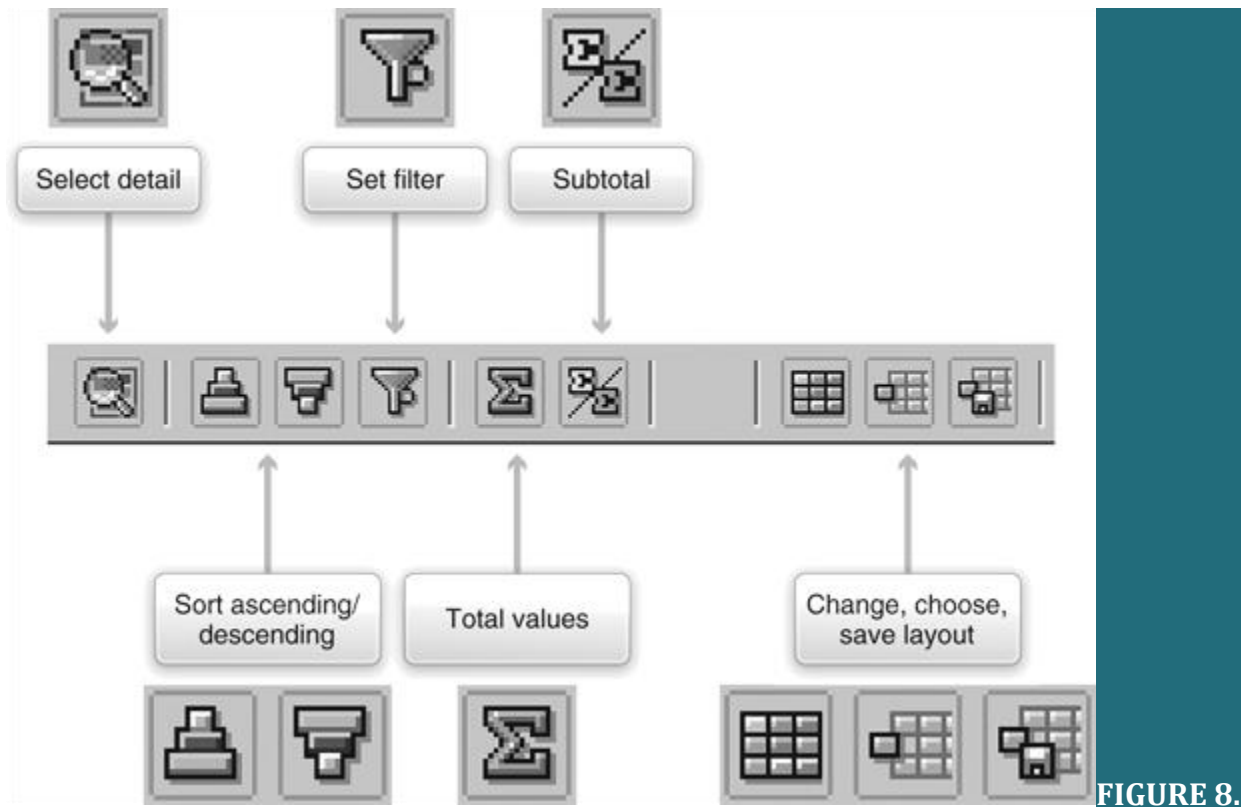


FIGURE 8.

18 Functions of the list viewer and grid control

- The *select detail* allows the user to select a line on the report and drill down for more details.
- The *set filter* option is used to limit the list to only those items that meet specified values. For example, the list can be restricted to purchase orders where the quantity ordered (one of the columns) exceeds a specified value.
- Lists can be *sorted* in ascending or descending order in a selected column.
- The *total values* and *create subtotals* options enable users to calculate totals and subtotals for selected columns, respectively.
- The *layout* options allow users to change the appearance of the display. The layout option displays a list of available fields that can be included in the report. Fields appear as columns in the report and can be added or removed as desired. The modified layout can be saved as a *variant* of the report, which can be used to re-create the report at a later time.
- Several options are available to *export* the data in various formats, such as MS Word, Excel, and HTML. In addition, the data can be e-mailed using the system's messaging capabilities.



INFORMATION SYSTEMS

Numerous information systems are available within SAP ERP to support most of the processes that we will discuss in this book. Information systems (IS) can be divided into three broad categories: logistics information systems (LIS), financial information systems (FIS), and human resources information systems (HRIS). Logistics information systems support all of the logistics processes. Recall from Chapter 7 that logistical processes are concerned with acquiring, storing, creating, and distributing materials. The components of LIS include purchasing IS, sales IS, inventory control IS (IWM processes), quality management IS, plant maintenance IS, and shop floor IS (production processes). The financial information system supports reporting related to the general ledger (e.g., balance sheet, income statement, statement of cash flows), accounts receivable, and accounts payable. The HRIS is used to retrieve information about different HR components such as personnel, positions, and jobs.

Recall that information systems are part of the OLAP component of SAP ERP, and they utilize information structures to provide analytic capabilities. There are two types of information structures—standard and user-defined. **Standard information structures** are predefined in the SAP ERP system, and they collect the data needed to generate the most commonly used reports. SAP ERP also enables users to define their own structures, known as **user-defined information structures**, to meet specific reporting requirements.

Finally, information structures enable users to conduct two types of analysis—standard and flexible. **Standard analysis** provides predefined analytics for data in standard information structures. This type of analysis is sufficient for most analytic requirements. When standard analysis is insufficient, users can conduct flexible analysis to customize the reporting. In contrast to standard analysis, **flexible analysis** allows users to define the content and format of the analysis. Specifically, it enables users to combine available characteristics and key figures as needed and to create new key figures using user-specified formulas. It also provides users with several layout options.

To summarize, the OLTP component of SAP ERP offers reporting in the form of work lists and online lists that are based on detailed transaction data. In contrast, the OLAP component offers reporting via information systems, based on aggregated data in information structures. These capabilities are limited to data within the SAP ERP system.

Today, however, companies need even more powerful reporting capabilities that combine data from multiple sources. This is the domain of business intelligence, which we discuss next.



Demo 8.6: Review SAP ERP Reports
Demo 8.6: Review SAP ERP Reports

BUSINESS INTELLIGENCE

Business intelligence is a general term that refers to the overall capabilities a company uses to collect and analyze data from a variety of sources to better understand its operations and make better managerial decisions. As we suggested in the previous paragraph, the OLAP environment within SAP ERP cannot perform the powerful analytic capabilities needed to provide business intelligence. For these purposes, businesses utilize SAP® Business Warehouse (SAP BW) (Figure 8.19).

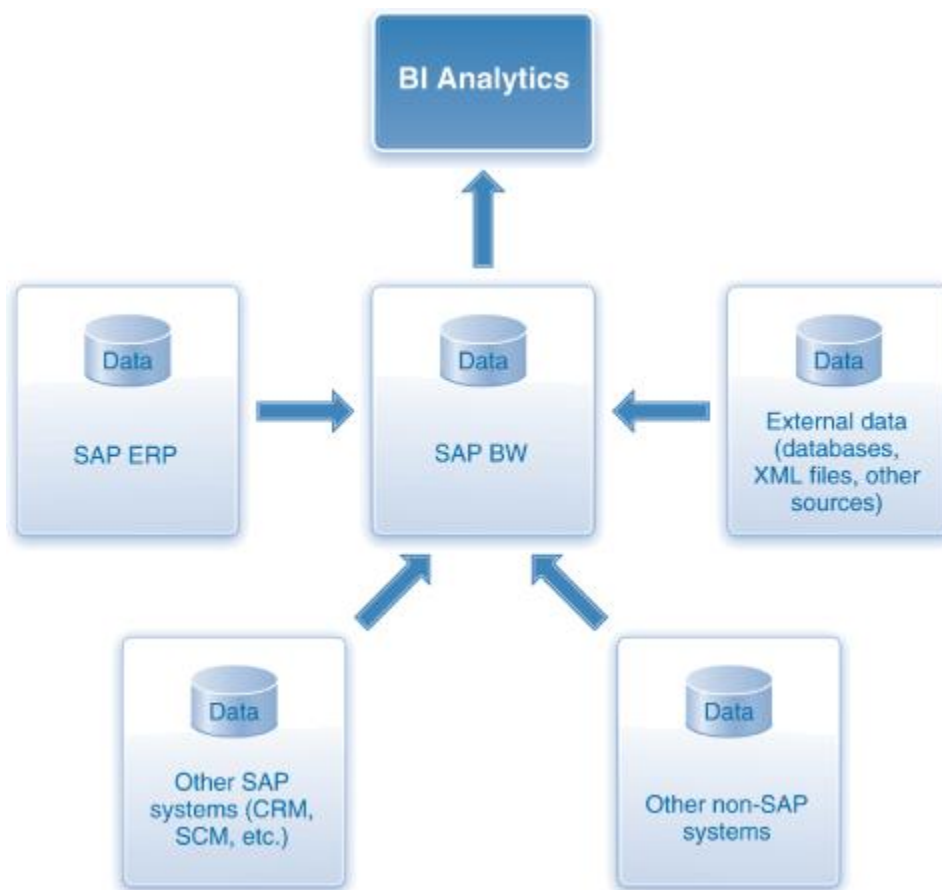


FIGURE 8.19 Reporting using SAP BW

SAP BW is a separate system that receives data from the SAP ERP system, other SAP systems such as SAP CRM and SAP SRM, and other non-SAP systems. These data are stored

in the SAP BW database. Whereas the SAP ERP system is used to execute process steps, the SAP BW system is designed and optimized for processing large quantities of data to provide powerful analytics. Unlike the OLAP environment in SAP ERP, SAP BW is not a real-time or an online system. That is, the data used in BW reporting are not tied to transactions and therefore are not the most current data available.

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CHAPTER SUMMARY

This chapter explains the evolution of enterprise systems in terms of the processes they manage and the technical capabilities they possess. In addition, it examines the different types of data that ES collect and utilize to execute processes and enable managerial decision making.

Enterprise systems evolved from the custom-built mainframe applications of the 1960s and 1970s into the three-tier client/server systems of the 1990s. They were then rebuilt to take advantage of the new technical capabilities of service-oriented architectures to expand their reach and value as business platforms. The largest and most complex ES are integrated ERP systems. ERP systems initially managed only intra-company processes. However, their capabilities were later extended to incorporate external or inter-company processes, such as customer relationship management and supply chain management. The combined collection of inter-company process-based applications and intra-company process-based systems forms an ES “application suite.”

Enterprise systems generate and consume vast quantities of different types of data in their operations. Data in enterprise systems can be classified into three major categories: organizational data, master data, and transaction data. Organizational data represent the structure of the enterprise. Examples are company code, plant, and storage location. Master data represent the various entities or materials that are associated with processes. Materials master data contain information needed to procure, store, manufacture, ship, and invoice physical goods and services. Transaction data are collected during the execution of a process and contain information such as dates, quantities, prices, and payment and delivery terms.

Reports include organizational data, master data, and transaction data and are used to support process execution and for managerial decision making. ERP systems provide multiple options for extracting and analyzing the different types of data for different

purposes. Information systems (IS) combine the various types of data for specific functions in the enterprise. IS also enable employees to easily access relevant data in ways that facilitate efficient decision making and operational oversight.

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MIS Notes

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Chapter 1: information systems and you

Q1: what is an information system?

- A system is a group of components that interact to achieve some purpose, an **information system (IS)** is a group of components that interact to produce information
- Customer relationship management (CMR) systems that use algorithms and databases to predict customer behaviours – all comprise a **five-component framework** of **computer hardware, software, data, procedures, and people**
- Hardware refers to the electronic components and associated gadgetry that constitute a computer system
- Software which has occasionally been used to refer to all of the intangible components of a system that were not hardware, but now is mostly just programs or applications

Q2: what is MIS?

- MIS has three key elements: **development and use, information systems, and goals and objectives**
- MIS is that information systems exist to help organization achieve their goals and objectives

Q3: how does IS differ from IT

- **Information technology (IT)** refers to the methods, inventions, standards, and products. As the term implies, IT refers to raw technology, and it concerns only the hardware, software and data components of an information system and how these are networked together, in contrast IS refers to a system of hardware, software, data, procedures, and people who produce information
- Only when the technology within the hardware, software, and data is combined with the people and procedure components- that IT becomes useful

Q4: How important are information systems to our economy

- **Information and communications technology (ICT) sector**, this sector is special because it provides products and services that other industries, such as retail, manufacturing, insurance, and banking rely on to get their work done

Q5: how do successful business professionals use information systems?

- Knowing how to use mobile devices and applications is just the first step. The most important task is to understand the technologies and business well enough that you can identify opportunities for innovation through technology
- It is noted that it is really important that individuals who have a core set of skills to introduce IS systems, including the following
 - Technical skills
 - Specific technology and industry experience
 - Satisfactory communication and other business skills
- Business professionals need to consider IT and IS when they think about the problems and opportunities that confront a department or organization

Q6: what is the shape of things to come?

- **MOORE's LAW** noted that the density of circuits on an integrated chips was doubling approximately every two years or so.
- A second major characteristic of IT has been what economists call "network effects" and "lock in" of certain technologies, where the value that is received increases significantly as the number of users increase.
- The final factors affecting information systems today are the general shrinking of device size (which of course is tied to Moore's law) the tendency for ubiquity or existence everywhere
- Wide-area networks (WAN) become cheap reliable and widely available

Chapter 3: Productivity, Innovation, and strategy

Q1: why should I care about productivity and innovation?

- Increases the amount of machinery and equipment (M&E) (particularly in the **information and communication technology (ICT) sector**) in the economy raising the ICT capital intensity means increasing the amount of technology that supports people working

- Robert Solow to make the now famous statement, “we see computers everywhere except in the productivity statistics” thus the **productivity paradox** was born. Although this issue is more than 25 years old **the question of how IT adds to productivity – that is how IT can be used to create business value**
- Researchers have suggested three different ways through which the value of IT can be realized. The first is **through productivity**. IT allows a company to create more and/ or better output from the same inputs and create them faster than before the technology was in place
- The second way in which the investment value of IT is realised is through **the structure of competition**. IT can alter the way corporations compete
- The final way that IT investment value is realized is through **benefits to the end customer**. IT helps make processes more efficient and changes the nature of competition

Q2: what is business technology management (BTM), and how is it related to productivity and innovation?

- The ICT industry for productivity and innovation because it includes technologies that can enhance individual and organization productivity across many industries
- The **Canadian coalition for tomorrow’s ICT skills (CCICT)** was founded by bell Canada in 2007 for this purpose. The CCICT created an industry led group of Canadian employer’s educational institutions and industries that could ensure the ability of Canadian organizations to hire ICT professionals for twenty first century workforce.
- This is named **Business technology management (BTM)**. These learning outcomes drew on skills frameworks such as the skills frame work for the information age program.

Q3: how do information systems improve productivity?

- Increasing **efficiency** means that **business process can be accomplished either more quickly or with fewer resources and facilities**. Efficiency is usually relatively easy to measure once you have decided what measures are important
- Increasing **effectiveness** rather than efficiency, they are interested in doing the right things. Increased effectiveness means that **the company considers offering either new or improved goods or service that the customer values**
- Sometimes. “Doing the right thing” and “doing things right” can be in conflict in a company. For example company A could be so focused on increasing efficiency that

it misses the fact that customers have changed and no longer Value Company's A product. Company A might be doing things right, but it is not doing the right things!

Business processes and value chain

- A value chain is a network of activities that improve effectiveness (or value) of a good or service
- In general, the **more value a company adds to a good** or service in its value chain, the **higher the price the company can charge** for the final product. The difference between the price the customer is willing to pay and the cost of the company incurs in moving the goods or services through the value chain is defined as the **margin**
- **Michael porter** identified two types of activities that support value chains primary activities and secondary activities
- **Primary activities:** are activities in which value is added directly to the product, these activities and many more referred to as **support activities** because they support the primary activities. However support activities add value only indirectly
 - **Support activities**
 - **Firm infrastructure**
 - **Human resources**
 - **Technology development**
 - **Procurement**

Q4: how are organization strategy and industry structure related

- One model used to assess an industry structure is Porter's **five forces model**, according to this model, five competitive forces determine industry profitability
 - **Bargaining power of customers**
 - **Threat of substitution**
 - **Bargaining power of suppliers**
 - **Threat of new entrants**
 - **Rivalry among existing firms**
- An organization responds to the structure of its industry by choosing a **competitive strategy**. Porter followed his five force model with a model of four competitive strategies (FIDC)
 - Cost
 - Differentiation
 - Industry-wide

- Focus
- An organization can focus on being the cost leader, or it can focus on differentiating its products from those of the competition. Further, the organization can employ the cost or differentiation strategy across an industry, or it can focus its strategy on a particular industry segment

Q5: what is the relationship between innovation and information technology?

- Professors Bower and Christensen described two general types of technological innovations. **Sustaining technologies** are **changes in technology that maintain the rate of improvement in customer value**. For example the vulcanization of rubber allowed tire manufacturers to produce tires that facilitated faster and more comfortable rides
- In contrast **disruptive technologies** **introduce a very new package of attributes to the accepted mainstream products**. For example in the music industry, the advent of MP3 was a disruptive technology because it offered the ability to store and play music through digital devices
- The theory of the **diffusion of innovation** was defined by Everett Rogers as “the process by which an innovation is communicated through certain channels over time among the members of a social system. Rogers identified five stages through which the diffusion of an innovation occurs. The stages or steps in the process
 - **Knowledge**
 - **Persuasion**
 - **Decision**
 - **Implementation**
 - **Confirmation**
- **The knowledge** stage occurs when you first hear about an innovation but lack specific information about it.
- **Persuasion** when you become interested in the innovation and find out more about it
- if you decide to pursue the innovation, you have reached the **implementation stage**
- if you are happy, then you reach the peaceful state of **confirmation**, where you use the innovation to its full potential

Q6: How do information systems provide competitive advantage?

Competitive advantage via products and services

- the first three principles
 - **create** a new product or service

- enhance products or services
- differentiate products or services
- organizations gain a competitive advantage by creating new products or services, by enhancing existing products or services, and by differentiating their products and services from those of their competitors

Competitive advantages via business products

- Organizations can retain customers by making it difficult or expensive for them to switch to another product. This business strategy is sometimes referred to as adding **Switching Costs**.
- Another way to gain competitive advantage is to establish alliances with other organizations. Such alliances create standards, promote products awareness and needs, develop market size, reduce purchasing costs and provide other benefits. Finally organization can gain competitive advantage by reducing cost.

Q7: can competitive advantage through information systems be sustained?

- We have noted that IT can provide a competitive advantage for companies.
- Competitors often react to innovation by replicating the technology
- Technology and software can be purchased or developed. It is therefor, almost impossible to keep competitors from developing competing technology
- As Nicholas Carr suggested “IT doesn’t matter” because it follows a similar pattern to earlier disruptive technologies such as rail ways and electricity, if we are talking about IT(hardware, software, and networks) than what car said is largely true, hardware and software have become readily accessible to most all companies. However if we consider information systems than what Carr said is less convincing because the same IT with installed in different organizations might result in very different outcomes.
- It is important to recognize that long term competitive advantages lies not with the technology but rather in how a company and its people adopt the technology
- **Sustained competitive advantage?** It requires companies to find a distinctive way to compete. The emphasis should be placed on developing increasingly sophisticated integration of IT and the people and procedures in the organization

Chapter 4: Hardware and software

Q1: why do you need to know about information technology?

- Knowing the basics about modern information technology (IT) (including Hardware software and networking) will not only make you more knowledgeable consumer of technology but also will help you consider how it can be used in business, recognize its positive and negative effects on society and think about what its future could be

Q2: Where did all this information technology stuff come from?

- The first digital computing devices was made in 1940
- First commercial computer 1950s
- Pc 1980
- Internet and cellular phones come into wide use during the 1990's

Early computers

- **ENIAC** (Electronic numerical integrator and computer), which was originally designed in 1946 to calculate, firing tables for ballistic missiles, was the first reprogrammable general-purpose computer.

Main frames

- The first commercial digital computers, which were large, room sized devices based on now obsolete vacuum tube technology were called mainframes.
- Main frames are mainly used by governments and companies
- Second gen mainframes became smaller (1950)
- Third gen mainframes introduced in the mid 60's included operating systems and multiprocessing capabilities

Microcomputers: 1975-present

- By 1981, the microcomputer had developed enough to launch the personal computers

Networking personal computers

- Invention of Local Area Network
- LAN revolutionised business computing by providing shared access to data, printers and other peripheral devices
- LAN was followed up by Wide area networks

Summary

1. Price and performance advances: IT is continuously evolving. According to Moore's law, in 18 months the price of a given integrated circuit (IC) will halved, or for the same amount of money, you will be able to buy a new IC with twice as many transistors
2. Small is powerful: the history of computing can be summarized as an ongoing effort to make IT smaller and more powerful
3. The network thing: the value of IT can be measured not only in the power of the processor but also in the power of the network that can be accessed through the machine

Q3: What does a manager need to know about computer hardware?

- **Hardware** consists of the physical electronic components and related gadgetry that input, process, output and store data according to instructions encoded in computer programs or software.
- All computers consist of four basic components
 - Input
 - Processing
 - Output
 - Storage
- **Input devices:** may be one of the two most visible or familiar parts of the computer
 - **Keyboards or touch screens**
 - A bar code scanner
 - Cash register
- **Processing Devices** include the **Central Processing Unit (CPU)** which is sometimes called the "brain" of the computer
- The CPU works in conjunction with the computer's Main Memory
- Random access memory-lol
- **Output hardware** such as display or monitor and many have printers and speakers
- **Storage hardware:** saves data and programs
- **Megabyte 1024 bytes** → 1024k gigabytes → terabytes

Q4: What is the difference between a client and a server, and what is cloud computing?

- Users employ **client** computers for word processing, spreadsheets, database access, and so forth
- **Servers**, as their name implies, provide services. Facebook, google, amazon, and YouTube all use servers that are accessed by other computers

- Servers computers often need to be faster larger and more powerful than client computers
- For a large commercial sites, such as google. The server is actually a large collection computers that coordinate all activities (called a SERVER FARM)
- **Cloud computing**, it is similar to the concept of servers that supply applications and data. In cloud computing, customers do not necessarily own the computers they use
- the cloud is a metaphor for the internet which makes software and data services available from any location at any time
- it builds on concept of **Grid Computing**, in which several computers are used to address a single problem at the same time

Q5: what does a manager need to know about software?

- Generally, computer software can be categorized into one of two varieties
 - Operating systems: which tend to be large and complicated programs that control the computers resources
 - Application software

What are the four major operating systems?

- **Windows**
- **Mac OS**
- **Unix** : is an operating system has been the workhorse of the scientific and engineering communities
- **Linux**: is a version of UNIX that was developed by the **Open source community**. This community is a loose group of programmers

Owning versus licensing

- many people talk about buying software, what is actually purchased is a license to use that program
- in the case of Linux, no company can sell you a license to use it because its owned by an open source community

What types of application exist, and how to obtain them

- **Application software**: consists of programs that perform a business function. Some application programs are general purpose, such as excel or word.

What category of application programs exist

- **Horizontal market application:** software provides capabilities common across all organizations and industries
- **Vertical market application:** software serves the needs of a specific industry. Examples of such programs are those used by dental offices to schedule appointment and to bill patients. Those used by auto mechanics to keep track of customers automobile repairs, and those used by parts warehouses to track inventory, purchases, and sales
- **One of a kind application:** software is developed for a specific, unique need.
- for example customer relationship management, software is a horizontal application because every business has customers
- **there also custom developed software**

What are firmware and utility software?

- **Firmware** is a computer software that is installed into such devices as printers, print servers and various types of communication devices
- **The basic input/ output systems (BIOS)** is an important piece of firmware. BIOS is used when a computer is initially started or “booted” up. BIOS is required because all volatile memory is lost when the computer is shut down

What is the difference between thin and thick client

- An application that requires nothing more than a browser is called a **THIN client**
- An application such as Microsoft outlook that requires programs other than a browser on the user’s computer is called a **THICK client**.
- **The terms of thin and thick client** refers to the amount of code that must run on a client’s computer

Q6: what buying decision does a manager need to make?

- Business managers also play a role in the specification of client hardware and software for employees whom they manage
- Large organization will have an IS department that is likely to set standards for client hardware and software

Q7: What are viruses, Worms and Zombies?

- **A virus** is a computer program that replicates itself. Unchecked replication is like computer cancer, the program code that causes unwanted activity is called the **payload**. The payload can delete program or data- or even worst modify data in undetectable ways

- **Macro-viruses** attach themselves to word, excel and other types of documents. When the infected document is opened the virus places itself in the start-up files of the application
- **Worm** is a virus that propagates using the internet or other computer network worms spread faster than other virus types because they are specifically programmed to spread. A computer with a worm virus is a ZOMBIE COMP

CHAPTER 5: USING IS TO IMPROVE PROCESSES

Q1: what are the fundamental types of processes in organizations?

- **Business process** as a sequence of activities for accomplishing a function.
- **Activity** as a task within a business process and resources as the items, such as people computers data and document collection necessary to accomplish an activity.
- **Actors** are resources who are either humans or computers
- **Finally a role** is a subset of activities in a business process that is performed by a particular actors

Examples of process

- For example sarah pizza restaurant, five processes are need to fulfill a pizza order.
 - Order- assemble, bake, package, and deliver

Scope of process

- We organize process into three categories, **Strategic, managerial, and operational**
- **Operational processes** are commonplace, routine, everyday business processes. At the pizza shop these include ordering suppliers, and ringing up customers **Transaction processing systems** help in this processes (**TPS**)
- **Managerial processes** concern resource use. These processes include planning, assessing, and analyzing the resources used by the company in pursuit its objectives. Information systems that facilitate managerial processes are sometimes call **MANAGEMENT INFORMATION SYSTEMS** (MIS)
- **Strategic process** seek to resolve issues that have long range impact on the organization these processes have broad scope and impact most of the firm. Information systems that support strategic process are sometimes called **executive support systems** (ESS)

Objective of processes

- An objective is a desired goal on organization has decided to pursue.
- An **effective** objective helps achieve organizational strategy, sarah pizza shop depends heavily on pizza sales to college

- An **Efficient** objective seeks more output with the same inputs or the same output with fewer inputs. The pizza shop might try to improve the efficiency of the deliver process
- In other words efficiency is doing things right, whereas effectiveness is doing the right things

Q2: what are examples of common business processes?

Inbound logistics processes

- Inbound logistics receives, stores and disseminates product input
- **Procurement** is an operational process that acquires goods and services procurement activities at the pizza shop include ordering ingredients and boxes, as well as receiving and paying for those items

Operation processes

- Operations transform inputs into outputs, operation processes schedule the equipment, people and facilities
- An example of a management operations process is scheduling maintenance on the ovens

Outbound logistics process

- Outbound logistics process collect store and distribute products to buyers. Outbound logistics processes concern the management of finished goods inventory and the movement of goods from that inventory to the customer
- An operational outbound process is the sales process

Sales and marketing processes- self explanatory

Service processes

- **Providing after sales and customer support.** Includes track orders, customer support and customer support training

Human resources

- Human resources process assesses the motivations and skills of employees; create job position; investigate employee complaints; and staff, train, and evaluate personnel

Technology development

- Technology development processes include designing, testing, and developing technologies in support of the primary activities

Q3: how can organizations improve processes

- **OMIS MODEL, for OBJECTIVES, MEASURES, and Information Systems**

Process objectives

- Each process has one or more objectives. The first step in the OMIS model is to specify and if possible improve the **objectives for the process**

Process measures

- The second step in the OMIS model is to **specify and if possible improve how each objective is measured**. Measures, also called metrics are quantities assigned to attributes
- The best measures are reasonable, accurate, and consistent. A reasonable measure is a measure that is valid and compelling.

Q4: how can organization use to IS to improve processes?

Three ways to improve IS

- One way to improve a process with IS is to improve the efficiency or effectiveness of the activities
- Information systems can also improve a process by improving the links among activities are either in the same process or among activities in different process. **The impact of one activity on another activity is called a LINKAGE**
- **a third way that IS can improve a process is to improve control of the process. In general CONTROL limits behaviour**

NON-IS process improvements

- We present the two general categories: add more resources and change the structure of the process
- A business can **improve a process by adding resources to a given process without changing its structure**. One way to reduce delays in the delivery process is to simply add more drivers
- A second way of altering a business is to change its structure. Process designers can change the arrangement of the activities of a process without changing resource allocation.
- **Six Sigma** seeks to improve process outputs by removing causes of defects and minimizing variability to the process

Participants and diagrams in process improvement

- Typically, the process includes the users who are the actors in the process managers and business analysts. Managers help by coordinating changes, acquiring the necessary resources, and motivating participants.
- Diagrams of current process are called AS IS diagrams
- Diagrams of suggested improvements are called OUGHT-TO-BE DIAGRAMS

Q5: how can a IS hinder a process?

- However, an IS can also reduce process efficiency and effectiveness and limit its improvement
- Storing data in multiple places can hinder a process and make it difficult to improve. The data could be stored in multiple places for a number of reasons and we will consider these shortly

Information SILOS

- **INFORMATION SILOS** are a condition that exists when data is isolated in separated information systems or when data are duplicated in various files and databases
- Information silos can make process inefficient,
- Information silos can make processes ineffective, anytime data is transcribed from one place to another or entered in two places errors can occur.
- The most obvious fix to eliminate information silos is to store a single copy of data in a shared database and revising business processes to use that database. A single copy data base solution is a feature of the ERP systems that we will discuss in the next three chapters

Why information silos exist

- This delay normally does not impact franchises, however several times a year sales are quite unusual and this delay leads to running out of items at the restaurants or unneeded deliveries. If the data were all in one systems, these problems would be less likely to occur
- If the problem of information silos are so evident and the ERP solutions so clear, why does this issue ever arise? Organization store data in separate databases for several reason
- **First:** organizational departments prefer to control the systems they use
- **Another reason:** departments set up their own databases is that they analyse the costs and benefits of the systems of using their own fairly narrow measures

- Only when many processes in many departments all rely on the same IS do the savings really accumulate
- Finally, departmental IS are much more affordable; enterprise systems can cost as much as 10 to 50 times as much as a single department application

Q6: how can SOA improve processes?

- **SOA** is a new IS approach designed to make it easier to share data amongst process activities
- To begin **SERVICE ORIENTED ARCHITECTURE (SOA)** is a design in which every activity is modeled as an encapsulated service and exchanges among those services are governed by standards. This definition has three key terms **SERVICE, ENCAPSULATION and STANDARDS**. Consider each

SERVICE

- A service is a repeatable task that a business needs to perform
- A service needs access to data to be efficient

Encapsulation

- The key term in SOA definition. Encapsulation hides details inside a container. In Networks, encapsulation is used to allow devices to communicate containers of data without being concerned about the data inside

Standards

- Data and more generically, messages are exchanged among services using standardized formats and techniques which are referred to as SOA standards
- Those standards eliminated the need for proprietary design and expanded the scope and importance of SOA
- SOA can improve the efficiency and Effectiveness of a process in the same ways an IS improves processes. SOA makes activities easier and hence less costly to access

CHAPTER 6: supporting processes with ERP systems

Q1: what problems does ERP systems solve?

- With imagination when a software engineer at SAP realized that his new networks and advances in database storage allowed them to create large, centralized, well connected databases that spanned entire companies
- The key to ERP systems is that data is consolidated in one central databases

Enterprise application integration (EAI)

- It connects information silos via new layer of software
- It enables existing application to communicate and share data
- It provides integrated data
- It leverages existing systems, leaving department information systems as is but providing an integration layer over the top
- It enables a gradual move to ERP

Enterprise resource planning (ERP)

- Is a product suite of software, a database, procedures and a set of processes for supporting business operation with a single consistent information system
- These systems intergrade process data from departments such as accounting, human resources. Sales and operations into a single system
- The primary purpose of an ERP system is integration. An ERP systems allows the “left hand of the organization to know what the right hand is doing”
- By consolidating the data in one place, the data are always up to date and available in real time to be used by any process in the organization

Q2: what are the elements of an ERP systems?

- Current ERP systems are particularly strong in the areas in which they were first developed, such as manufacturing and supply process
- Through the use of **material requirements planning (MRP)** to efficiently manage inventory, production, and labour. As computer power became cheaper, **Manufacturing resource planning (MRP II)** was developed that added financial tracking capabilities as well as the opportunity to schedule equipment and facilities.
- **JUST IN TIME (JIT)**, manufacturing occurs just as raw material arrive synchronizes manufacturing
- **The Sarbanes Oxley act (SOX)** required companies to exercise greater control over their financial processes, and ERP systems addressed that new requirement
- **SUPPLY CHANGE MANAGEMENT**
- **MANUFACTURING**
- **CUSTOMER RELATIONSHIP MANAGEMENT**
- **HUMAN RESOURCES**
- **ACCOUNTING**

FIVE COMPONENTS OF ERP

- **ERP SOFTWARE:** Accomplished inter process data integration. This customization is called configuration
- **ERP DATABASES:** an ERP solution includes a gigantic, but largely unpopulated database; database design; and initial configuration. Good database is essential, ERP can have 25k tables
- **ERP PROCEDURES:** IS procedures are instruction methods for users to interact with the application. Training the employees of a business on how to interact with ERP systems can be a time consuming and costly operation
- **ERP HARDWARE:** each ERP implementation requires a wide variety of hardware including disk storage, server, clients, printers etc.

- **Collaboration:** occurs when two or more people work together to achieve a common goal result or product. Collaborative effort is driven by four critical factors:
 - Communication skills and culture: the ability to be a part of a group and to give and receive critical feedback particularly important for employers.
 - Communication systems: Email, virtual private networks, IM. These systems are dependent on the network technology available in an organization.
 - Content management: When multiple users are contributing and changing documents, schedules, task lists and assignments is crucial to keeping track of tasks.
 - Workflow control: A process or procedure by which content is created, edited, used and disposed of. (Similar to business process → BO focuses on good service externally whereas WC focuses on good service externally)
- **Network Externalities:** The larger the number of people using a network, the more valuable that network becomes.
- **Network:** is collection of computers that transmit and or receive electronic signals through transmission media
- **Transmission media:** Can be physical media such as copper cable and optical fiber cable or wireless media transmitting light or radio frequency. Main 3 are:
 - LAN (local area network): Computers connected at a single physical site.
 - WAN (wide area network): Computers connected between two or more separate sites.
 - Internet: Network of networks.
- **Switch:** Special purpose computer that receives and transmits messages on the LAN.
- **Network Interface Server (NIC):** Hardware component that connects the device's circuitry to the network cable. (LAN Cable)
 - Media access control: What most NIC have, unique identifier.

- Most connections are made using UTP or unshielded twisted pair cables.
- **IEEE (Institute for Electrical and Electronic Engineers)**
- **IEEE 802.3 protocol AKA Ethernet**
- **IEEE 802.11n WIFI**
- **M-Commerce (mobile commerce):** allows users to conduct new kinds of transactions through your phone.
- **BYOD (bring your own device)**
- Routers connects your computer to computers owned and operated by your Internet Service Provider (ISP) → 3 main functions:
 - Provides your computer with IP address
 - Serves as your gateway to the internet
 - Pay for the internet
- **Hypertext transfer protocol (HTTP)**
- **Top Level Domains (TLD):** .com .org .ca
- **Uniform Resource Locator (URL)**
- **Domain Name System (DNS):** To convert human friendly URLs into computer friendly IP addresses. This process is called domain name resolution, which is performed by domain name resolvers.
- **Digital subscriber line (DSL):** Operates on the same lines as voice telephones, but it operates in such a way that its signals do not interfere with voice telephone service.
- **Asymmetric DSL (ADSL):** Faster download than upload
- **Symmetric DSL (SDSL):** Fast download and upload
- **Narrowband:** Transmit speeds less than 56kbps (Dial up)
- **Broadband:** Transmit speeds more than 256kbps
- **WWAN → Wireless wide area network:** data for your phone
- **Network Layers**
 - 4 layers → transmission control program/ internet protocol (TCP/IP)

- Application layer
 - Data are passed between programs (such as email app, web browser and file transfer programs) and the transport layer.
 - Transport Layer
 - This layer deals with opening connections and maintaining them. It uses the **Transmission Control Program. TCP works to ensure packets are received with correct content.**
 - Internet Layer
 - This layer works with IP addresses. There are many ways to navigate packets from one IP address to another. The internet layer standards also control packet organization and timing constraints.
 - Network Access Layer
 - This layer describes the equipment that is used for communication (UTP, fiber optic) the signaling used and the protocols that will be used to communicate between machines.
- **Firewall:** is a computing device that prevents unauthorized network access.
 - **A Port:** A number that is used to uniquely identify a transaction over a network. The port number specifies the service provided.
 - A firewall also often has an **access control list (ACL)** which keeps track of which IP addresses are to be allowed and which are to be prohibited.
 - **Encryption:** The process of transforming clear text into coded, unintelligible text for secure storage or communication. Encryption process is as follows:
 - Your computer obtains the public key of the website to which it will connect
 - Your computer generates a key for symmetric encryption
 - Your computer encodes that key using the website's public key. It sends the encrypted symmetric key to the website.
 - The website then decodes the symmetric key using its private key
 - From that point forward, your computer and the website communicate using symmetric encryption.

Virtual Private Networks (VPN): uses the internet or a private internet to create the appearance of private point to point connections.

- **Enterprise Application integration (EAI):** system tackles the silo problem by providing layers of software that connect info systems together. EAI is software that enables information silos to communicate with each other and to share data. It also does the following:
 - It connects information silos via a new layer of software
 - It enables existing applications to communicate and share data.
 - It provides integrated data.
 - It leverages existing systems, leaving departmental information systems as is, but providing an integration layer over the top.
 - It is cheaper than ERP and provides the same benefits
 - **Enterprise Resource Planning (ERP):** A suite software, a database, procedures and a set of processes for supporting business operations with a single, consistent, information system.
 - ERP systems standardize processes and bring the data from a company's processes into one place so that the data can go out to many places in real time. (usually consolidates data about customers, products, people, equipment, machinery...)
 - **Material Requirements Planning (MRP):** Efficiently manage inventory, production and labor.
 - **Manufacturing Resource Planning (MRP II):** Added financial-tracking capabilities as well as the opportunity to schedule equipment facilities.
- Just in Time (JIT):** JIT synchronizes manufacturing and supply—manufacturing occurs just as raw materials arrive. (Tight supplier relationships were needed)

Sarbanes-Oxley Act (SOX): Required companies to exercise greater control over their financial processes, and ERP systems addressed that new requirements.

- As business changes, so must ERP. Today, for a product to be considered a true ERP product, it must include applications that integrate the processes in the following business functions:
 - Supply chain management
 - Manufacturing
 - Customer relationship management

- Human resources
- Accounting

To create an ERP product, an organization installs the software and databases on hardware and trains its people to use procedures.

Consider each component:

- ERP Software: Accomplishes intercrosses data integration. The software typically resides on servers and on client machines in the company. The software can be customized to meet customer requirements without changing program code. This is called *customization*.
- ERP Databases: An ERP solution includes a gigantic, but largely unpopulated, database; a database design, and initial configuration data. It does not, of course, contain the company's actual operational data.
- Procedures: IS procedures are instructions and methods for users to interact with the application. Training the employees of a business on how to interact with an ERP system can be a time consuming and costly operation.
- Hardware: Each ERP implementation requires a wide variety of hardware, including disk storage, servers, clients, printers, scanners...
- People: The people involved with an ERP system fall into three roles. Users are the employees of the firm implementing the system. Analysts are also employees, who have specialized training or education that enables them to support, maintain and adapt the system after it has been implemented. A third role is consultant, who works for the ERP vendor or a different company (Third party) and helps budget, plan, train, configure and implement the system.
- Inherent business processes: ERP also specify processes for the implementing organization. These processes are called "inherent processes". For the implementing organization, some of the changes it must make from existing processes to ERP processes are minor and hardly noticed, but some changes can be significant.

Benefits of an ERP system:

- Implements processes that industry best practices
 - Examples: Buying in bulk, negotiating prices prior to purchase, and a centralized procurement requisition approval activity.
- Data sharing occurs in real time
 - Allowing managers to see trends as they are occurring and to respond appropriate
 - Management can be more insightful and provide better oversight
 - More managers have more access to information/data
- The information silo problem is solved
 - Departments no longer create and maintain their own purchasing database.

Challenges of implementing ERP

- Must ask the following questions for implementation decisions:
 - What do we select as our item identifier?
How long are resupply times
 - What will be our order sizes
 - Which bill of materials format should we use (BOM: recipe of materials needed to create the product)
 - Who approves customer credit and how?
 - Who approves production capacity and how?
 - What actions need to be taken if the customer modifies the order?
 - How does management obtain oversight on sales activity?
- For each of these decisions, implementation teams must decide among choices offered by the ERP vendor
- People decisions is another challenge. The actions and attitudes of the people in the implementation organization can make the situation even more challenging.

- People tend to resist change even when the benefits of the change are well known.
- Top management involvement after initial decision to implement should be frequent
- Top management oversells capabilities
- Perceived threat to department autonomy (threatening the way things are done usually)
- Failure to specify objectives and measures of new processes

Types of organizations who use ERP

- Industry Type
 - It has spread over time between, manufacturing, distribution, government, education, retail, utilities.
- Organization Size
 - The range from all sizes: small, midsize and multibillion dollar ones. The key difference between them all is the availability of skilled businesses and IT analysts that allow them to implement the systems better.
- International ERP
 - International ERP solutions are designed to work with multiple currencies, manage international transfers of goods in inventories, and work effectively with international supply chains.

Who are the major ERP vendors? (In order of market rank)

1. SAP: Largest vendor, most comprehensive solutions and largest customers.
2. Oracle: Combination of in-house acquired products. Intensely competitive company with a deep base of technology and high quality staff.
3. Infor: Privately held corporation that has acquired an ERP product named Baan, along with more than 20 others. Has many solutions.
4. Microsoft Dynamics: Four products acquired by acquisition: AX, Nav, GP and Solomon. Not well integrated with Office. Not integrated at all with Microsoft development language.
5. Epicor: Strong industry-specific solutions, especially retail. Highly configurable. Lower cost.

What are the fundamentals of a procurement process

- Procurement: Is the process of obtaining goods and services. It is an operational process executed hundreds of thousands of times a day in a large organization.
Examples:
 - Inbound logistics
 - Operations
 - Sales and marketing
 - Customer service
- Purchase order: Written document requesting delivery of a specified quantity of a product or service in return for payment.
- There are usually two types of inventory:
 - Raw materials inventory: Components of the bicycle such as tires, frames, seats etc....
 - Finished goods inventory: Is the completed products waiting for delivery to customers.

How did the procurement process at CBI work before SAP

- Invoice (itemized bill): Amount due and the purchase order number.
- Three-way match: Making sure that the data on the invoice matches the data in the purchase order and goods receipt.

What were the problems with the procurement process before SAP?

- Warehouse: Growth in finished goods inventory reduces warehouse space for raw material inventory. Warehouse manager does not have data on sales price discount.
- Accounting: Three-way match discrepancies take time to correct. Accounting data are not real time.
- Purchasing: Purchasing agents not centralized, training experience motivation difference. Weak internal controls lead to limited scrutiny of purchases.

How does CBI implement SAP?

- Strategy examination process has three activities:
 - Determine industry structure
 - Bargaining power of customers
 - Threats of substitutes
 - Bargaining power of suppliers
 - Threat of new entrants
 - Rivalry
 - Commit to a specific competitive strategy
 - Develop objectives and measures for processes to support the competitive strategy.
 - Smaller finished goods inventory
 - Fewer errors
 - Better financial control
 - More responsive to customers

Purchase requisition: An internal company document that issues a request for a purchase. The computer is the actor, not the human.

How can SAP improve the integration of supply chain Processes at CBI?

- Supply Chain Processes
 - Supplier Relationship Management: Management process that helps companies reduce procurement costs, build collaborative supplier relationships etc...
 - Returns Management process: Manages returns of faulty products for businesses.
 - Supplier Evaluation Process: Determines the criteria for supplier selection and adds and removes suppliers from the list of approved suppliers.
- Supply Chain Process Integration
 - Supply Chain Management: Integration of supply chain processes (design, planning, execution and integration) It is improved by sharing data between processes and increasing process synergy.

- Improving Supply Chain Process Integration by Sharing Data
 - Bullwhip effect: Occurs when companies order more supplies than are needed due to a sudden change in demand.
- Improving Supply chain Process Integration by Increasing Process Synergy
 - Bottleneck: Occurs when a limited resource greatly reduces the output of an integration series of activities for processes.
- SAP Integration Problems with Emerging Technologies
 - Augmented Reality (AR): Computer data or graphics are overlaid onto the physical environment. Using AR, warehouse workers at CBI can look at video game images of the warehouse and see overlaid on top of the image data about the location of a product that are looking for, the arrival date of the next shipment of a particular item or the weight of a container.
 - Radio-frequency identification (RFID): Used to identify and track items in the supply chain. Chips, broadcast data to receivers that can display and record the data.

E-commerce: The buying and selling of goods and services over public and private computer networks. There are many varieties:

- Merchant companies
 - Business-to-business (B2B)
 - Business-to-consumer (B2C)
 - Business-to-government (B2G)
- Nonmerchant Companies
 - Auctions
 - Clearinghouses
 - Exchanges

B2C: Concerns sales between a supplier and a retail customer. A typical information system for B2C provides a web-based application or *web storefront* by which customers enter and manage their orders.

B2B: Refers to sales between companies. (Raw materials suppliers to manufacturers to distributors etc...)

B2G: refers to sales between governmental organizations. (almost like B2B)

E-commerce auctions: Match buyers and sellers by using an e-commerce version of a standard auction. This e-commerce applications enables the auction company to offer goods for sale and to support competitive bidding process. (ebay)

Clearinghouses provides goods and services at a stated price and arrange for the delivery of the goods, but they never take title. (Amazon)

Electronic exchanges: Other example of clearinghouses businesses that match buyers and sellers; the business process is similar to that of a stock exchange. Sellers offer goods at a given price through the electronic exchange, and buyers make offers to purchase over the same exchange. Price matches result in transactions from which the exchange takes a commission. (Priceline.com)

+ Ecommerce does lead to better market efficiency

Disintermediation: The removal of intermediaries between parties. (Middle men such as wholesalers, distributors or retailers were replaced with the internet) This results in higher revenues for manufacturers and lower consumer prices.

Price elasticity: Measures how much demand rises or falls with changes in price. Using auction as an example, a company can learn not only what the top price for an item is but also the second, third, and other prices of the losing bids.

Issues with E-commerce:

- Channel conflict
- Price conflict
- Logistic expense
- Customer service expense
- Showrooming
 - (when a customer learns about or tries a product or service in the high cost bricks-and-mortar retail store while completing the sales transaction at low-cost internet sales channel of another retailer)
- Taxation
 - (Different provinces have different taxes and so the government has trouble finding how to tax e-commerce accordingly)

Social Network: Is a structure of individuals and organizations that are related to each other in some way. *Social networking* is the process by which individuals use relationships to communicate with others in a social network.

Business literature defines three types of capital: Physical, human and social

- Physical capital: is the investment of resources for future profit. This traditional definition refers to investments in physical resources, such as factories, machines...
- Human capital: is the investment in human knowledge and skills for future profit. Taking this class for example is human capital.
- Social capital: Is the investment in social relations with the expectation of returns in the marketplace. When you attend a business function for the purpose of meeting people and reinforcing relationships, you are investing in your social capital. Social capitals adds values in four ways:
 - Information

- Influence
- Social credentials
- Personal reinforcement

+ According to Henk Flap, the value of social capital is determined by the number of relationships in a social network, by the strength of those relationships, and by the resources controlled by those related.

Using social networks expands your network of “friends” which give you a bigger chance in enlarging your contacts. This can be added to you business value.

How has networking been enabled by technology? Besides the ubiquity of computers, and the relative low cost, three other considerations are:

- Improved search capabilities
 - Important to social networking because they enable us to quickly sort through large amounts of data and find the specific people or relationship that we are interested.
- Reduction in the trade off of richness and reach
 - The ability to keep track of many more people and enhance personalization.
- 3 network effects
 - As a network grows, the benefit or utility that each person adds tends to increase. This can accelerate the speed at which networks grow and how useful they become.

Web 2.0: was first popularized in 2005 by Tim O’Reilly to refer to the integration and interaction of products and services, such as smartphones, user-created content, social networking, location and context-based services, and dynamic marketplaces, and not as specific technology.

Software as a service (SAAS): Instead of software license fees, the Web 2.0 business model relies on advertising or other revenue that results as users employ the software.

User-generated content (UGC): Refers to website content that is tribute by users. On some sites, users can provide customer support to one another or even participate in the creation of product specifications, designs, and complete products in a process called *crowdsourcing*. (kickstarter.com) Crowdsourcing combines social networking, viral marketing, and open-source design, saving considerable cost while cultivating customers.

* Web 2.0 user interfaces are organic, whereas office programs share a common user interface. Further, Web 2.0 encourages *mashups*, which result when the output from two or more websites is combined in to a single user experience. (Google's My Maps)

* Traditional sites about publishing; Web 2.0 is about participation. Users provide reviews, map content, discussion responses, blog entries etc...

* Advertising: In Web 2.0 advertising can be specific to user interests. (Ad Words by Google charges a 2\$ fee to companies who pay to have their "words" pop up first in the search bar).

* Mashups can also happen to non-Internet companies. (The bay supplies clothing from a movie)

Acquiring a new software application is similar to buying a car. There are five basic ways to do it:

- Buy it and use as is
- Buy and customize it
- Rent or lease it
- Build it yourself
- Outsourcing

Project Management Body of Knowledge (PMBOK): Guide that notes that a project “consists of a temporary endeavor undertaken to create a unique product, service or result”

IT Projects: Things such as installation of a new email application, a CRM system, or an enterprise resource planning (ERP) system. *not always about technology, they affect data, people and processes.

Information technology project management (ITPM): Is the collection of techniques and methods that project managers use to plan, coordinate, and complete IT projects.

5 process groups in any project:

- initiating
- planning
- executing
- controlling
- monitoring

9 project management ideas:

- integration management
- scope management
- time management
- cost management
- quality management
- human resources management
- communication management
- risk management
- procurement management

Workers continually seek ways to improve the efficiency and security of the entire set of systems that support operations: These active systems are often referred to as **production systems**.

Information Technologies Infrastructure Library (ITIL): well recognized collection of books that provide a framework of best-practice approaches to IT operations.

System Development Life Cycle (SDLC): The classic process used to acquire information systems. 5 phase process:

- System definition
- Requirement analysis
- Component design
- Implementation
- System maintenance

System Definition: Define the goals and scope of the new information system. The development team defines true goals and purpose of the new system in terms of these purposes.

- Define system goals and scope
- Assess feasibility
- Form project team
- Plan project

Requirement Analysis: to form the project team and develop the requirements.

The project manager and IT personnel can be internal personnel and outside contractors. Typical personnel on a development team are a manager, **system analysts**, programmers, software testers and users. The work of analysis and design is often completed by **business analysts** and system analysts.

Commercial off-the-shelf (COTS) software will never fit your organizational requirements exactly

Component Design: The team designs each component by developing alternatives, evaluating each of those alternatives against the requirements, and then selecting among those alternatives.

- Determine hardware specifications
- Determine software specifications
- Design the database
- Design procedures
- Create job definitions

Implementation: Tasks in this phase include building, testing and converting the users to the new system. Developers construct each of the components independently, they obtain, install and test hardware. The license and install off-the-shelf programs and write adaptations and custom programs, as necessary...

- Build system components
- Conduct unit test
- Integrate components
- Conduct integrated test
- Convert to new systems.

Next step is system testing

Test plan consists of sequences of actions that users take when using the new system.

Product quality assurance (PQA) aka testing consists of constructing the test plan with the advice and assistance of users.

Beta Testing is the process of allowing future system users to try out the new system on their own.

Next step is System Conversion: used to refer to this activity because it implies the process of converting business activity from the old system to the new. There are four steps

- Pilot: Implements the entire system in a limited portion of the business. Advantage
→ if the system fails, the failure is contained within a limited boundary.

- Phased: the new system is installed in phases across the organization.
- Parallel: the new system runs in parallel with the old one until the new system is tested and fully operational.
- Plunge (aka cutover installation): The organization shuts the old system down and starts the new system.

Maintenance

- Record request for change:
 - Failure
 - Enhancements
- Prioritize requests
- Fix failures:
 - Patches
 - Service packs
 - New releases

Problems with the SDLC

Waterfall method: Like a series of waterfalls, the process is often described as a sequence of non repetitive phases. Unfortunately, systems development seldom works so smoothly. Often, there is a need to crawl back up the waterfall, so to speak, and repeat the work done in a prior phase.

Another problem is the difficulty of documenting requirements in a usable way.

Outsourcing is the process of hiring another organization to perform a service. Just about any business activity in the value chain can be

How is the IT department organized?

- Chief Information Officer (CIO): Principle manager of the IT department. Reports to the CEO, though sometimes these executives report to the chief operating officer (COO) who in turn reports to the CEO.
- Chief Technology Officer (CTO): Sorts through new ideas and products to identify those that are most relevant to the organization. The CTO's job requires deep knowledge of information technology and the ability to envision how new IT will affect the organization.
- Third group in the IT department is development. This group manages projects that acquire new information systems as well as maintains existing information systems. The department is usually staffed by business analysts or system analysts who work with users, operations and vendors to acquire and install licensed software and to set up the system components around that software.
 - are normally involved in developing the business case for a newly purposed system as well as the requirements for that system.
 - System analysts are normally involved in designing and implementing the new system.
- The last department is outsourcing relations. This group exists in organizations that have negotiated outsourcing agreements with other companies to provide equipment applications or other services.

The web

- It can take a lot of people to make a great website because a number of skills are involved. For example, a web design project usually consists of the following people:
 - Project manager: Responsible for interacting with the client and moving the project successfully toward completion.
 - Lead designer/analyst: Responsible for understanding the clients needs and developing the overall look and feel of the site.
 - Developer: Responsible for taking the design and creating the functioning site.
 - Technical architect: Responsible for making decisions about technical issues related to the site, including server/browser support...

What jobs exist in IT services?

- Computer technician: Install software, repair computer equipment and networks.
- Quality assurance test engineer: Develop test plans, design and write automated test scripts, perform testing
- User support representative: Help users solve problems provide training.
- Technical writer: Write program documentations, help-text, procedures job descriptions, training materials.
- Programmer/ developer: Design and write computer programs.
- Website designer: Work with clients to develop designs for websites work with developers to finalize designs.
- Network administrator: Monitor, maintain, fix and tune computer networks
- Database administrator: Manage and protect database
- System analyst/business analyst: Work with users to determine system requirements, design procedure
- Consultant: Wide range of activities: testing to project management...
- Salesperson: Sell software, network, communications and consulting services.
- Project manager: Initiate, plan, manage, monitor, and close down projects.
- Enterprise F: Manage and document the technological infrastructure of the firm.
- Chief technology officer: Advise CIO, executive group and project managers on emerging technologies
- Chief information officer: Manage IT department communicate with executive staff on IT and IS related matters. Member of the executive group.

What is IT architecture?

- Competitive strategy: Supported by activities in the value chain, which consists of a collection of business processes supported by information systems.
- IT architecture : It lays out the street network system, water system, sewer system, emergency services and power grids. It is the basic framework for all services.

- Enterprise architect: To create a blueprint of an organizations information system and the management of these systems.
- **Zachman framework**: developed by John Zachman in the 1980s, the framework divides the system into two dimensions: One is based on six reasons for communication and the other is based on stakeholder groups (planner, owner, designer, builder, implementer, and worker)

What is alignment, why is it important and why is it difficult?

- Alignment: The process of matching organizational objectives with IT architecture; it is an ongoing process.
- Communication between business and IT executives is the most important indicator of alignment. Successful companies find ways to help share knowledge and frustration between the IT department and the business functions. This shared knowledge can become a source of competitive advantage for the firms because the firms are better able to align their IT investments with the overall business objectives.

What is information systems governance?

- Governance: The development of consistent cohesive management policies and verifiable internal processes for information technology and related services.
- Bill 198/ Budget measures act/Sarbanes oxley act: Laws which force companies to comply with governance standards for collecting, reporting and disclosing information. Require management to create internal controls sufficient to produce reliable financial statements and to protect the organizations assets.

What is an information system audit and why should you care about it?

- Information systems audit: Similar to a financial audit. The focus is placed on information resources that are used to collect store process and retrieve information. Today, there is a greater focus on the information systems audit anthe establishment of methods for examining and verifying organizations information systems policies and procedures.
- Information Systems Audit and Control Association (ISACA): An organization that was formed in 1969 by a group of individuals who were in charge of auditing controls for newly developed computer systems.
- Certified Information Systems Audit (CISA): A certification that is recognized globally and has been earned by more that 90 000 professionals.

- Control objectives for information and related technology (COBIT): A framework of best practices designed for IT management. This framework provides board members, manager, auditors and IT users with a set of generally accepted measures, indicators, processes and best practices to assist them in getting the best from their organizational IT investments.

What is information systems ethics?

- Information system ethics: Computers are great at manipulating logic, but machines are not people, so they have no sense of decency of understanding what it is doing. Machines are not people, so they have no sense of decency, nor have they established character, which is an important part of being human. Information ethics is about understanding our own behavior – the way we think and act in situations in which our choices affect others. We face choices in situations, and these choices should be guided by principles.

What is green IT and why should you care about it?

- Green IT: Using IT resources to better support the triple bottom line for organizations.
 - Triple bottom line: Measures of traditional profit along with ecological and social performance. There are many elements of Green IT, but its primary goals are to improve energy efficiency, promote recyclability and reduce use of materials that are hazardous to the environment.
 - Example is ENERGY STAR program: International government-industry partnership that is intended to produce equipment that meets high-energy efficiency specifications or promotes the use of such equipment.
- E-cycling: Recycling of electronics or computing devices.

COMM 226 NOTES

Chapter 1

Moore's law: the number of transistors per square inch on an integrated chip doubles every 18

months

Because of moore's law, the cost of data processing, communications, and storage is basically

zero.

Importance of MIS in business school today:

- Future business professionals need to be able to assess, evaluate, and apply emerging

information technology to business

- collaboration

- employment

How MIS helps you learn nonroutine skills:

- Abstract reasoning: ability to make and manipulate models

Systems thinking: ability to model the components of a system and to connect the inputs and

outputs among those components into a sensible whole, one that explains the phenomenon

observed. E.g.: output of production is the input to the sales process

Experimentation: making a careful and reasoned analysis of an opportunity, envisioning potential

products or solutions or applications of technology, and then developing those ideas that seem to

have the most promise, consistent with the resources you have

MIS: "Management Information Systems" ; the management and use of processes, information

systems, and information to help organizations achieve their strategies. Three key elements:

1. Processes, information systems, and information

2. Management and use

3. Achieve strategies

Processes, information systems, and information

- Process: way of doing something

- Information systems: collection of components, including but not limited to a computer,

that stores and retrieves data and produces information

- Information: meaningful insight that helps employees do their jobs

Management & Use

- Management (of MIS) is the creation, monitoring and adapting of processes, information

systems and information

Achieve Strategies

- Help organizations achieve their strategies

Competitive strategy: organization's goals and objectives

Figure 1-8

Five forces that determine industry structure (profitability):

1. Threat of **substitutes** (performs the same or similar function as an industry's product by another means)
2. Threat of new entrants (industry's barriers to entry & reaction new entrants can expect from established companies in the industry)
3. Existing rivals
4. Bargaining power of suppliers
5. Bargaining power of customers

Porter's four fundamental competitive strategies: cost, differentiation, industry-wide, focus

Figure 1-11

- Porter defined value as amount of money that a customer is willing to pay for a resource, product or service.
 - Difference between value that an activity generates and the cost of it = the margin
 - Value chain: network of value-creative activities ; consists of 5 primary activities and 4 support activities
- 5 primary activities in a value chain:
1. Inbound logistics: receiving, storing and disseminating inputs to products
 2. Operations & Manufacturing: transforming inputs into final products
 3. Outbound logistics: collecting, storing and physically distributing products to buyers
 4. Sales & Marketing: including buyers to purchase products and providing a means for them to do so

5. Customer service: assisting customer's use of products and thus maintaining and enhancing the product value

Four Support Activities in Value Chain

Support activities: contribute indirectly to all of the primary value chain activities:

1. procurement : process of finding vendors, setting up contractual arrangements and

negotiating prices

2. Technology: includes research and development, and other activities within the firm for

developing new techniques, methods and procedures

3. Human resources: recruiting, compensation, evaluation and training of full and part time

employees

4. Firm infrastructure: general management, finance, accounting, legal and government

affairs

Value chain linkages: interactions across value activities. E.g.: manufacturing systems use

linkages to reduce inventory costs

Figure 1-15: bpmn

Chapter 2

Business process: sequence of activities for accomplishing a function. E.g.: add a class to the

business curriculum

Activity: task within a business process. E.g.: computer final grades

Business process model and notation (BPMN): technique for documenting business processes

Includes: roles, actors and swimlanes

- Roles (columns): subset of the activities in a business process that is performed by a

particular actor

- Actors: can be people (or computers)

- Swimlanes (columns): contains all the activities for a particular role

Figure 2.1

Repository: a collection of something, usually a collection of records; looks like a small tin can

Benefits of standardizing processes:

- Policies can be enforced
- Results are more consistent
- Processes can be copied and reused; they are scalable
- Risks from errors and mistakes are reduced

Information system

System: group of components that interact to achieve some purpose

Information system (computer-based information system): group of components that interact to

produce information

Five component framework for IS:

1. Computer hardware
2. Software
3. Data
4. Procedures (set of instructions for a person to follow when operating an IS; e.g.: filling out information for FB account)
5. People

Processes can be divided in 2 broad categories:

1. Structured processes: formally defined, standardized processes. E.g.: day-to-day operations = scheduling work shifts, calculating daily sales tax totals, etc.
2. Dynamic processes: less specific, more adaptive and even intuitive. E.g.: deciding whether to open up a new store location

Various definitions for “information”:

1. Knowledge derived from data, whereas data is defined as recorded facts or figures
2. Information is data presented in a meaningful context
3. Information is processed data or sometimes, information is data processed by sorting, filtering, grouping, comparing, summing, averaging and other similar operations

4. Information is any difference that makes a difference

Main idea about information: information is not data, it is more; varies from person to person;

located inside of you

Using these ideas about information:

- assume it is hard to communicate
- Recognize that all new information systems are frustrating at first
- Understand how to be effective on a team
- Stay curious

Necessary data characteristics:

1. Accuracy
2. Timely
3. Relevant (to context & subject)
4. Sufficiency
5. Worth its cost

Chapter 3

Hardware components

Central processing unit (CPU): “the brain” of the computer, selects instructions, processes the,

performs arithmetic and logical comparisons and stores results of operations in memory

- Dual - processor: computer with 2 CPU
- Quad - processor: computer with 4 CPUs

Main memory: CPU works in conjunction with main memory; CPU reads data and instructions

from memory, and it stores results of computations in main memory which is also known as

RAM (random access memory)

Storage hardware: used to save data and programs. E.g.: magnetic disk, CD, DVD, thumb drives

Types of Hardware

- Personal Computer (PC) (including desktops and computers): apple mac pro
- Tablet (ebook readers): ipad, kindle fire, nexus 7

- (smart) phone: motorola (google), droid
- Server: dell poweredge server
- Server farm: racks of servers

Computer data

- Computers represent data using binary digits called “bits” which is represented by either

a “0” or a “1”

- Data can be numbers, characters, currency amounts, photos, recordings, etc
- A switch can be either “opened” or “closed”; a computer can be designed so that an open switch represents “0” and a closed switch represents “1”

- Bits that are grouped in 8-bit chunks are known as “ **bytes** ”

Storage-capacity terminology

- Bytes: number of bits to represent on character
- “K” = Kilobyte: 1,024 bytes
- “MB” = Megabyte: 1024K = 1,048,576 bytes
- “GB” = Gigabyte: 1,024 MB = 1,073,741,824 bytes
- “TB” = Terabyte: 1,024 GB = 1,099,511,627,776 bytes
- “PB” = Petabyte: 1,024 TB = 1,125,899,906,842,624 bytes
- “EB” = Exabyte: 1,024 PB = 1,152,921,504,606,846,976 bytes

CPU speed is expressed in cycles known as “hertz”

Operating system (OS): program that controls computer’s resources

- Functions: read and write data, allocate main memory, perform memory swapping, start

& stop programs, response to error conditions and facilitate backup and recovery, create

& manage the user interface, including the display, keyboard, mouse, and other devices

Major operating Systems

1. Non-mobile client operating systems: used on personal computers. E.g.: microsoft windows
2. Mobile clients: used on phones. E.g.: android, blackberry OS, iOS
3. Servers: windows server, unix, linux

Categories of computer software:

Operating systems:

1. Client: programs that control the client computer's resources
 - Application programs: applications that are processed on client computers
2. Server: programs that control the server computer's resources
 - Application programs: applications that are processed on server computers

ARM: Power-saving computer architecture that is designed for portable devices such as phones

and tablets

Virtualization: process by which one computer hosts the appearance of many computers

- One operating system, known as "host operating system" runs one or more operating

systems as applications

- Those hosted operated systems are known as "virtual machines" (VM)

3 types of virtualization:

1. PC virtualization: a personal computer, such as a desktop or portable computer, hosts

several different operating systems

2. Server virtualization: a server computer hosts one or more other server computers

3. Desktop virtualization: a server hosts many versions of desktop operating systems

Own vs. License

License: when you buy a computer program, you are actually purchasing the license to use that

program (not own). E.g.: buying a Windows license, Microsoft is selling you the right to use

Windows

Site License: a flat fee that authorizes a company to install the product (Operating system or

application) on all company's computers or on all of the computers at a specific site

Applications & how organizations obtain them:

Application Software: performs a service or function

Categories of application:

- Horizontal market application: software provides capabilities common across all organizations and industries. E.g.: word processors, graphics program, spreadsheets, presentation programs
- Vertical market application: software serves the needs of a specific industry. E.g.: programs used by dental offices to schedule appointments and bill patients
- One of a kind application: software is developed for a specific, unique need. E.g.: the IRS

develops such software, because it has needs that no other organization has

Different ways you can buy computer software:

1. Off the shelf software: horizontal & vertical applications
2. Off the shelf software with alterations software: vertical applications
3. Customer developed software (tailor-made software): one-of-a-kind applications

Firmware: computer software that is installed into devices (printers, print servers, communication device), is coded & installed into special, read-only memory of the printer (or

other device) & becomes part of the device's memory

Source code: computer code that is written and understood by humans

Machine code: source code that is compiled into machine code that is processed by a computer;

not understandable by humans and cannot be modified

- "Open source": source code of the program is available to the public. E.g.: open office,

firefox (browser), android

- "Closed source": source code is highly protected and only available to trusted employees

and carefully vetted contractors

Applications can be categorized as:

Native applications: can run on just one operating system

- Developed using serious, heavy-duty, professional programming languages
- All of these "languages" are **object-oriented** meaning they can be used to create difficult,

complex applications & (if used properly), will reach in high-performance code that is

easy to alter when requirements change

- Benefit of object-oriented: give programmers close control over the assets of the computing device and enable the creation of sophisticated/complicated user interfaces

- Con of native application: they are “native”, only run on the operating systems for which

they are programmed, general cost = high

Thin-client applications: can run in browsers on many different operating systems

- Such applications run inside a browser (firefox, chrome, safari, internet explorer)

- Browser handles the idiosyncrasies of the operating system & underlying hardware

- Pros: cheaper, languages used (html5, css3, javascript) are not object-oriented and are

much easier to learn, will run on any operating system & device

- Cons: limited by the capabilities of the browser, thus are unable to support specialized &

complex applications

User interface (UI): the presentation format of an application

- Consists of windows, menus, icons, dialog boxes, toolbars, etc

- **User experience (UX)** = newer term; refers to not only UI but how the user responds to

the application

Characteristics of quality mobile UX

- Feature content and support direct interaction

Chrome is a term that refers to the visual overhead in computer display

Direct interaction: using content to drive application behavior. E.g.: when you see blue,

underlined type, you know to tap on it to navigate to that web site

- Use context-sensitive chrome when needed

Mobile applications do provide chrome, but it is **context-sensitive chrome**, it pops up in the

display when appropriate

- Provide animation and lively behavior

- Design to scale and share (display and data)

Applications must be designed so that they can scale up and down without appearing awkward or taking over the device

- Use the cloud

Quality applications utilize data and computing resources that are remote from the user and are

likely not even known by the user

Roaming; when users move their activities, (especially long-running transactions, e.g.: reading a

book) across devices. The best mobile applications do this transparently; the user need to take no

action

Figure 3-11

Data communications

A computer network is a collection of computers that communicate with one another over

transmission lines or wireless connections. There are 3 basic types of networks:

1. Local area network (LAN): computers connected at a single location; number of connected computers can range from 2-several hundred

2. Wide area networks (WAN): connect computers between 2 or more separated locations

3. Internets: a network of networks; data must flow seamlessly across communication

methods, therefore **layered protocol** is used (**protocol** = set of rules that 2 communicating devices follow)

Bluetooth: common wireless protocol; designed for transmitting data over short distances,

replacing cables

Connecting LAN to the Internet

When you connect to the internet you are actually using an Internet Service Provider (ISP). ISP:

has three important functions:

1. Provides you with a legitimate internet address

2. Serves as your gateway to the Internet
3. ISPs pay for the Internet

Small office/Home office (SOHO) LANS are connected to an ISP in 3 ways:

1. Digital subscriber line (DSL Line): operates on the same line as voice telephones, but does not interfere with voice telephone services
2. Cable TV line: provides high-speed data transmission using cable television lines
3. Wireless-phone like connection (WAN wireless connection)

Typical web server

Almost all e-commerce application use the three-tier architecture, which is an arrangement of

user computers and servers into 3 categories (or tiers)

1. User tier: consists of computers, phones and other devices that have browsers that request and process web pages
2. Server tier: consists of computers that run web servers and process application programs
3. Database tier: consists of computers that run a DBMS that processes requests to retrieve and store data

When you enter a website in your browser, the browser sends a request that travels over the

internet to a computer in the server tier at the website indicated

In response to request, a server-tier computer sends back a Web Page, which is a document that

is coded in one of the standard page markup languages (most popular markup page languages =

html)

Web servers are programs that run on a server-tier computer and that manage the http traffic by

sending and receiving web pages to and from clients

A commerce server: application program that runs on a server-tier computer; receives requests

from users via the web server, takes some action & returns a response to the users via the web server

Figure 3-23 three-tier architecture

Hypertext markup language (HTML): most common language for defining the structure and layout of web pages

- An html “ **tag**” is a notation used to define a data element for display or other purposes

- **Hyperlinks** : included in webpages; pointers to other webpages

- Tags have **attributes** (most of the time) which is a variable used to provide properties

about a tag

- Attribute for a hyperlink is **href**, and its value indicates which web page is to be displayed when the user clicks the link

The cloud

Defined as the elastic leasing of pooled computer resources over the internet

- Known as “cloud” because early diagrams of three-tier and other internet based systems

used a cloud symbol to represent the internet

- The term “elastic” refers to the amount of resources leased can be increased or decreased

dynamically, programmatically, in a short span of time and organizations pay only for the

resources used

- Resources are “pooled” because many different organizations use the same physical

hardware; they share that hardware through virtualization

- Resources are accessed via “internet protocols and standards”; are additions to TCP/IP

that enable cloud-hosting vendors to provide processing capabilities in flexible yet standardized ways

Why is the cloud preferred vs. in-house hosting?

Figure 3-27

Three factors have made cloud-based hosting advantageous today:

1. Processors, data communication and data storage are so cheap as to nearly free
2. Virtualization technology enables the near instantaneous creation of a new virtual machine
3. Service-oriented architecture (SOA): applications use standard protocols to publish a menu of services that the application provides, the structure of the data that it expects to receive, the structure of the data it will produce & the ways in which services can be requested

Using the cloud does not make sense if: Organizations are sometime required by law or by

industry standard practices to have physical control over their data

- However, private cloud, in-house hosting, delivered via web service standards, can be

configured dynamically = more physical control

How Organizations use the cloud: three categories

1. SaaS: software as a service; e.g.: iCloud, Office 365
2. PaaS: platform as a service; e.g.: Microsoft Azure, Oracle on Demand
3. IaaS: infrastructure as a service; e.g.: Amazon EC2 (Elastic cloud 2), Amazon S3 (Simple storage service)

Chapter 5

Characteristics of Process:

Stability of flow

- Structured: activities typically follow a fixed predefined sequence. E.g.: lodging into your email account
- Dynamic: more informal; activity sequence is less fixed. E.g.: collaborating with classmates on a group project

Scope

- Operational: common, routine, day-to-day
- Mix of actors: more computers than other processes

- Frequency of occurrence: high
- Examples: order supplies, pay bills, check out customers
- IS supporting this type of process: **transaction processing system (TPS)**
 - Managerial: allocation & use of resources
- Mix of actors: mix
- Frequency of occurrence: medium
- Examples: assess seasonal promotions, plan & schedule cashiers
- IS supporting this type of process: **Management information system (MIS)**
 - Strategic: broad-scope, organizational issues
- Mix of actors: more people than other processes
- Frequency of occurrence: low
- Examples: decide on new restaurant location, corporate budgeting
- IS supporting this type of process: **Executive support system (ESS)**

Objectives: can happen at all three levels of processes (operational, managerial, strategic)

- Efficiency: process creates more output with the same inputs or the same output with

fewer inputs. E.g: for pizza-making process = going green & use less energy

- Effectiveness: helps achieve an organizational strategy. E.g.: creating better-tasting pizza

Location in value chain

Primary activities:

- Inbound logistics: receiving, storing and disseminating inputs to products
- Operations: transforming inputs into final products
- Outbound logistics: collecting, storing and physically distributing products to buyers
- Sales & marketing: inducing buyers to purchase products and providing a means for them to do so
- Service: assisting customer's use of products and thus maintaining and enhancing the product's value

Support activities:

- Human resources
- Technology development
- Infrastructure

Value chain activity Operational process Managerial process Strategic process

Primary activities

Inbound logistics Procurement:

acquires

goods/services

E.g.: at pizza shop

→ordering, receiving

& paying for

ingredients & boxes

Manage inventory Evaluate potential
suppliers

Operations Assemble product Schedule
maintenance

Open new resto.

Outbound logistics Sales process:

records the sales

order, ships the

product & bills the
customer

Award refund Determine payment
policy

Sales & marketing Mail promotion Evaluate promotional
discounts

Launch new product

**Service (customer
service)**

Track orders Evaluate complaint
patterns

Evaluate outsourcing
options

Support activities

Human resources Recruit employees Plan future needs Determine pay scales

Technology development

Test software Estimate milestones Evaluate acquisition options

Infrastructure Quality assurance test Generate financial statements

Decide to pursue the patent

Applying Process Characteristics

- Ask good questions about objectives
- Standardize structured processes (making pizzas & tracking orders); keep dynamic processes flexible (dealing with customer complaints; each different in their own way)

- Don't confuse process & IT
- Ensure processes work together

How can management improve processes?

Process improvement: means that a process better achieves its objectives based on its measures.

Can be better assessed through 2 main concepts:

1. Process objectives: managers must specify and communicate appropriate objectives

- Classify objectives as effective/efficient to overcome ambiguity
- Make unstated objectives explicit
- Ensure objectives are appropriate for strategy

2. Process measures: managers must specify/communicate measures for each objective that

are:

- Reasonable (valid and compelling), accurate (exact & precise), consistent (reliable)
- measures = metrics = key performance indicators "KPIs" → e.g.: measure of the deliver process is elapsed time in minutes and seconds from leaving the store to arriving to customer's home

How can information systems be used to improve processes?

An IS can improve a process in 5 ways:

1. Improve an activity

- E.g.: driving activity improved with GPS

2. Improve data flow among activities

- E.g.: display order process data on GPS in delivery process

3. Improve control of activities

- E.g.: better control of order details

4. Use automation: “automation” = computer does activity or part of an activity instead of

human (who used to do activity)

- E.g.: send scheduled tweets in twitter promotion process

5. Improve procedures

- Payment procedure improved and payment process performs better

How can process management principles improve processes?

Process principles that can improve processes:

Improvement category Examples in pizza shop

Improve activity Improve parking activity

Remove unproductive resources Remove unnecessary drivers

Improve feedback Give boss late delivery report

Remove **bottleneck**: when one activity reduces the performance of overall process

Add waiters

Redesign the structure Specialize cooks

Outsource activity Outsource accounting activities

How do process teams diagram process improvement?

Two types of diagrams:

1. “As-is”: diagrams of the current process

2. “Ought-to-be”: diagrams of suggested improvements

How can IS hinder a process?

Information silo:

- If an IS prevents or restricts the flow, this can hinder a process

- The data needed for a process activity is unavailable because it is stored in an

isolated, separated information system

- E.g.: your smartphone → having music, mail, chat, contacts & other data on your smartphone that is **not easily synced** with similar programs on your laptop

Why information silos exist – organizations store data in separate databases for several reasons:

- Organizational departments prefer to control the data they use
- Some processes use sensitive data that should not be shared with other processes
- Departmental IS is cheaper than enterprise systems

Chapter 6

What problem does an ERP solve?

ERP systems solve silo problems:

- ERP are very large enterprise IS that bring data together in a big database and help a company improve its processes

Two solutions (*enterprise systems*) to silo problem:

1. ERP (Enterprise resource planning): solves silo problem with centralized approach. Has 2

key characteristics:

- Creates a single database; by consolidating data a company can avoid the problem of having multiple versions of the same thing → e.g.: storing data about a customer in 2 silos and not knowing which customer data is correct

- Provide a set of industry-leading processes that are well integrated with each other

→ e.g.: data from a new sales sent to database & speeds the process of production & procurement of supplies

2. EAI (Enterprise application interface): provides layers of software that connect information systems together. Does the following:

- Connection information silos via a new layer of software
- Enables existing applications to communicate and share data
- Provides integrated data

- Leverages existing systems, leaving departmental information systems as is, but providing an integration layer over the top

- Enables a gradual move to ERP

- **Major benefit:** enables organizations to use existing applications while

alleviating many of the problems of information silos

What are the elements of an ERP?

History of ERP Evolution:

- 1970s: material requirement planning (MRP); managed inventory, production & labor

- Computing power became cheaper → manufacturing resource planning (MRPI); Added financial tracking capabilities, schedule equipment & facilities

- Just in time (JIT) delivery: integrates manufacturing & supply (manufacturing occurs just as supply arrives)

Today for a product to be considered an ERP, must include applications that integrate processes

in the following business functions:

- Supply chain management (SCM): procurement, sales order processing, inventory management, supplier management and related activities

- Manufacturing: manufacturing scheduling, capacity planning, quality control, bill of materials, and related activities

- Customer relationship management (CRM): sales prospecting, customer management, marketing, customer support, call center support)

- Human resources (HR): payroll, time & attendance, HR Management, commission calculations, benefits administration, and related activities

- Accounting: general ledger, accounts receivable, accounts payable, cash management, fixed-asset accounting

Five components of an ERP:

1. Software:

- Typically resides on servers and on client machines in the company

- Can be customized without changing code → customization = **configuration**

2. Hardware: disk storage, servers, clients, printers, scanners, network devices & cables

- New hardware: cloud computing; enables ERP systems to be rented at much lower upfront cost, stored on cloud vendor hardware & paid for by use

3. Data: three types of data

- Transactional data: related to events such as a purchase or a student enrollment

- Master data “reference data”: used in the organization that do not change with

every transaction → e.g.: supplier names & addresses

- Organizational data: location of warehouses, mailing addresses of buildings, etc

4. Procedures: set of instructions for a person to follow when operating an IS.

- Types of procedures: hiring procedures, production procedure, procurement procedure, other procedures

- 1st step: crafting procedure, 2nd step: training employees to use procedure

- **Train the trainer:** to reduce expenses, vendors sometimes train organization's users to become in-house trainers in training sessions called train the trainer

5. People: fall into 3 categories

- Users: employees of the firm implementing the system

- IT Analysts "system analysts": also employees with specialized training/education

- Consultant: works for the ERP Vendor called a *third party*, & helps budget, plan, train, configure & implement the system

ERP Career opportunities:

- Consultant: employed by firm other than implementing company or ERP vendor, can perform any of the following roles during implementation

- Systems analyst: understands technical aspects of ERP; helps plan, configure and implement ERP system for company use

- Developer: writes additional code where necessary for implementing ERP systems

- Project manager: defines objectives; organizes, plans and leads team that implements ERP solution

- Business analyst: understand process aspects; helps plan, configure and implement ERP system for company use

- Architect: high-level planner of IS; ensures compatibility of technology and directs technology toward strategic goals

- Trainer: trains end users on how ERP system operates, explains their roles and trains trainers

Access control: specifies limits on who can interact with an IS resource

- E.g: person A only has access to screens and data based related to being a purchasing agent; they do not have access to person B's data who works in personnel salary

Inherent business processes: ERP systems are more than an IS; they also specify processes called

inherent processes or **process blueprints**

Process of putting together an ERP:

1. Top manager revisits strategy so that ERP system has clear goals
2. Conduct **gap analysis**: study that highlights the differences between the business requirements & capabilities of ERP system
3. Implementation team develops processes it will use and configures the software
4. IT staff writes procedures, trains the users, and tests the system

Benefits of an ERP system

1. Data sharing occurs in real time
2. Implements integrated processes that are industry best practices
3. More managers see more data, leading to better oversight
 - ERP can provide management with **dashboards** = easy to read, concise, up-to-the minute displays of process KPIs
4. The information silo problem is solved
5. Better integration with supply chain partners

Challenges of implementing an ERP

Implementation challenges fall into 2 categories:

1. Decision making
 - ERP vendor selection
 - Gap analysis: decide on limited numbers of “like to dos” and what to do with gaps
 - Configuration: identifiers, order sizes, **bill of material (BOM)** : specifies raw materials, quantities, and subassemblies needed to create a final product
 - Data issues
 - Cutover pressure
2. People
 - Management: moves on prematurely, oversells, fails to anticipate cultural resistance
 - Team: collaboration breaks down
 - Individual: users feel pain and get no gain

Erp upgrade challenges:

- Surprise and resistance

- Justification
- **Version lock** from customization: occurs when ERP vendor upgrades their system to a new version, the new ERP software may not be compatible with the customization done by client firms

- No long-term upgrade strategy

Type of organizations that use ERP

ERP by industry:

- Manufacturing
- Distribution
- Mining, materials, extraction, petroleum
- Medical care
- Government and public service
- Utilities
- Retail
- Education

ERP by Organization size:

- Small organization: employ only one or two IT analysts who not only manage the ERP system but also the entire IS Department
- Medium organization: small staff of IT analysts, often isolated from senior-level management
- Large organization: full IT staff headed by CIO (chief information officer), a business and IT professional who sits in executive board and participates in organizational strategic planning

International firms and ERP:

- Need of large organization differ from small one due to *international presence*
- **Single instance:** international firms consolidate all their operations within one large ERP implementation
- **Multiple instances:** ERP for each country, business unit or region

Major ERP vendors:

Tier 1 ERP vendors:

1. SAP (largest market share & history) “systems, applications, products”
- Gold standard of ERP Products
 - Used by midsized and large organizations

- Offers **industry-specific platforms** to speed up configuration process; which is a preconfiguration platform that is appropriate for a particular industry such as retail, manufacturing or health care
 - SAP = collection of interconnected and interdependent **modules** which is a distinct & logical grouping of processes (e.g.: sales & distribution module = collection of processes supervised by marketing dept.)
2. Oracle: intensely competitive, deep base of technology and high-quality staff
 3. Microsoft dynamics: composed of 4 ERP products: AX, Nav, GP & SL

SAP Modules:

QM: Quality management PP: Production planning

FI: Financial Accounting CO: Controlling

PM: Plant maintenance SD: Sales & distribution

HR: Human resources MM: Materials management

PS: Project systems BI: Business intelligence

SAP Software:

- SAP Business Suite: rebranded version of SAP
- Runs on a program called an *application platform* also known as “NetWeaver”
- NetWeaver connects SAP to hardware, third-party software & output devices, also has SOA capabilities that help it integrate SAP with non-SAP applications
- **ABAP** is SAP’s high-level application language that is used to enhance the functionality of an SAP implementation

Chapter 7

The fundamentals of a procurement process

Procurement: the process of obtaining goods & services such as a raw materials, machine spare

parts, and cafeteria services. Three main procurement activities:

1. Order → done by purchasing manager
2. Receive → done by warehouse manager
3. Pay → done by accountant

Procurement process within the value chain

Primary activity Description

Inbound logistics Receiving, storing and disseminating inputs to products

Operations Transforming inputs into final products

Outbound logistics Collecting, storing and physically distributing products to buyers

Sales and marketing Inducing buyers to purchase products and providing the means for them to do so

Customer service Assisting customer's use of products and thus maintaining and enhancing the product's value

Terminology:

Purchase order (PO): written document requesting delivery of a specified quantity of a product or

service in return for payment

Raw materials inventory: stores goods procured from suppliers

Finished goods inventory: the completed products awaiting delivery to customers

Lead time: time required for a supplier to deliver an order; ends when the order arrives at the

warehouse and the receive good activity occurs

Invoice: itemized bill received by the supplier which includes amount due and purchase order

number

Three-way match: between invoice, purchase order, and receipt for goods, with color coding for

matching data

Internal control: systematically limit the actions and behaviors of employees, processes, and

system within the organization to safeguard assets and achieve objectives

Purchase requisition: is an internal company document that issues a request for a purchase

Problems with procurement before SAP was introduced

Role Problems SAP Benefits

Warehouse problems Warehouse manager does not

have data on sales price

discounts

Integrated inherent process
allows warehouse to see sales
process prices

Accounting problems Three-way match
discrepancies take time to
correct. Accounting reports

Real-time data sharing limits
errors. Real-time data sharing
reduces roll-up time
are not real time

Purchasing problems Purchasing agents not
centralized; experience and
motivation vary. Weak
internal controls lead to
limited scrutiny of purchases

Integrated purchasing activity
of ERP system. Real-time
data sharing increases use of
financial reports

Determine industry structure with 5 forces model:

1. Threat of substitutes
2. Threat of new entrants
3. Existing rivals
4. Bargaining power of suppliers
5. Bargaining power of customers

SAP & supply chain processes improvements:

Supply chain processes:

1. Supplier relationship management (SRM): process automates, simplifies, and accelerates
a variety of supply chain processes
2. Returns management process (RMP): manages returns of faulty products for businesses
3. Supplier evaluation process: determines the criteria for supplier selection and

adds/removes suppliers from the list of approved suppliers

Sample of supply chain processes:

Process scope Supply chain processes

Operational procurement

Managerial SRM & RM P

Strategic Supplier evaluation

Improving supply chain processes:

Supply chain processes are improved when data is **shared** .

- E.g.: data from Returns Management process about defective product should be shared with Supplier Evaluation process to ensure that suppliers with high defect rates are removed from the list of approved suppliers

Sharing data reduces the **bullwhip effect** which is when companies order more supplies than are

needed due to a sudden change in demand

Process integration: occurs when processes are mutually supportive; when one process is done

well the objectives of another process are also achieved

- Reduces the chances of a **bottleneck** , occurs when a limited resource greatly reduces the output of an integrated series of activities/processes

Impacts of SAP on organizations:

- New skills needed
- Process focus
- More data sharing
- Outsourcing: many firms outsource part of their production to take advantage of other firms that can produce a service cheaper than they can

New IS that will impact supply chain processes by 2024:

- Augmented reality (AR): computer data or graphics are overlaid onto the physical environment
- Radio frequency identification (RFID): small, cheap, chip that broadcasts data to receivers that can display and record the data; can be used to identify and track items in the supply chain
- Sensors
- Robotics

- 3D printing also known as “ *additive manufacturing* ” : objects are manufactured through the disposition of successive layers of material

Chapter 5 (database and content management)

What is content?

Content: something of value & can be considered an asset just like other items of property

- Closely related to **intellectual property** which is a form of creative endeavour that can be protected through a trademark, patent, copyright, industrial design, or integrated circuit topography
- Examples of content: word-processing documents (.doc, .txt, .pdf), spreadsheets (.xls), presentations (.ppt)

Organizing content:

- Content management systems (CMSs): helps companies organize content through a series of steps supported by software

Purpose of a database: keeping track of things; it is a self-describing collection of integrated

records

- Lists that involve a single theme can be stored in a **spreadsheet**
- Lists that involve multiple themes require a **database**

What does a database contain?

A **byte** is a character of data, bytes are grouped into **columns** (such as student # & student

name), columns are also known as **records**, a group of similar records(or rows) is called a **table**

or file ...a database is a collection of tables plus relationships among the rows in those tables, plus

special data (**metadata** = data that describes data) that describe the structure of the database

Key: is a column or group of columns that identifies a unique row in a table (every table must have a key)

Foreign keys: keys from a different (foreign) table from the one which they are placed in

Relational databases: carry their data in the form of tables and represent relationships using foreign keys

Database Management System (DBMS): software program used to create, process, and administer a database

- Almost no organization develops its own DBMS
- Companies license DBMS products from vendors (Microsoft, IBM, Oracle)
- Top 5 DBMS products: DB2 (IBM), Access & SQL Server (Microsoft), Oracle (Oracle corporation)

Components of a database application system:

1. User
2. Database application: collection of **forms, reports, queries**, application programs that process a database. May have one or more applications that have one or more users

- **Forms:** used to read, insert, modify, and delete data

- **Reports:** show data in a structure context

- **Queries:** professor types in the keyword for which they're looking for

3. DBMS: database management system

4. Database: collection of tables, relationships, metadata

Functions of DBMS:

- Create tables, relationships and other structures in the database

- Process the database; uses four operations: *read, insert, modify, delete*

- **Structured query language (SQL):** international standard language for processing a database. “ *Query* ” = question, “ *SQL* ” = formal way of putting a question to a database

- Provide tools to assist in the administration of the database (used as a security system, backing up database data, etc.)

Multiuser processing problems:

- Lost-update problem → to prevent this problem some type of locking must be used to coordinate the activities of users who are unaware of each other

Enterprise DBMS vs. Personal DBMS

Entreprise:

- Process large organizational and workgroup databases
- Support many users & many different database applications
- Support 24/7 operations
- Manage databases that span dozens of different magnetic disks with thousands of gigabytes or more of data
- E.g.: DB2 (IBM), SQL Server (Microsoft), Oracle

Personal:

- Designed for smaller, simpler database applications
- Used for personal or small workgroup applications
- Fewer than 100 users (normally fewer than 15), can have 1 single user
- E.g.: Microsoft Access

Chapter extension 5a: database design

Data model: logical representation of the structure of the data; contains a description of both the data and the relationships among the data

Techniques for creating a data model:

1. **Entity-relationship Diagram (ERD):** developers describe the content of a database by defining **entities** that will be stored in the database and the **relationships** among those entities

2. Unified modelling Language (UML): less popular

Entities:

- **Entity:** something that users want to track.

- Can be physical objects: item, salesperson
- Can be logical construct/transaction: order, contract
- Always singular

- **Attributes:** describe characteristics of an entity

- E.g.: attributes of “order”: order number, order data, subtotal

- **Identifier:** entities have an identifier which is an attribute (or group of attributes) whose value is associated with one and only one entity instance

- E.g.: identifier of “order”: order number

Relationships

- Entities have relationships to each other
- E.g.: *order* has a relationship with *customer* and *salesperson* entities

Lines between relationships:

- **Crow's foot:** multiple, little lines between entities

- Different lines related to different relationships:

● **One-to-many (1: N):** one entity can have many of another entity. E.g.:

one department can have many advisers

● **Many-to-many (N:M):** many of one entity can have many of another entity. E.g.: one advisor can have many students and one student can have many advisers

● **One-to-one (1:1):** one entity can have only one other entity

Minimum cardinalities vs. maximum cardinalities

- Minimum: constraints on minimum requirements; minimum number of entities required for a relationship
- Maximum: constraints on maximum requirements; maximum number of entities required for a relationship

Optional vs. required: symbol indicated on crow's foot

- Optional: "o" entity is optional; the relationship need not have an entity of that type
- Required: "☒" means that at least one entity of that type is required

Two important database design concepts:

1. Normalization: process of converting poorly structured tables (remove duplicated data &

other problems) into 2 or more well-structured tables

- Data integrity problems: can only occur if data is duplicated → example: "accounting" name change is correctly made in 2 rows, but not in the 3rd row

2. Representing relationships:

Steps in transforming a data model into a relational database design:

- Represent each entity with a table
- Entity identifier becomes a table key (primary key)
- Entity attributes become table columns
- Normalize tables as necessary

- Represent relationships
- Use foreign keys “FK”
- Add additional tables for *many-to-many* relationships

User’s role:

- Users are the final judges of what data the database should contain and how the records in that database should be related to one another

Chapter extension 5b: using microsoft access 2013

Chapter 8

Challenges managers face when making decisions (Ackoff’s assumptions):

- Information overload (Overabundance of irrelevant data): poor decisions are made because managers lack relevant information
- Uncertainty: too many possibilities exist
- Poor data quality: managers are often unsure just what data they require
- Dirty data: e.g.: “B” for customer name
- Missing values: name, age
- Inconsistent data
- Data not integrated: data reside in different sources/are incompatible with the intended purpose
- Wrong granularity: too fine, not fine enough
- Too much data: too many attributes, too many data points

Role of information systems to meet some of these challenges:

- Can both help and hinder the process of information overload by helping managers find the appropriate data and incorporating them into their decision-making processes
 - OLTP: provides raw information about transactions and status for an organization
- OLTP & how it supports decision making:

Information systems are a critical component for capturing details about transactions:

Because they are very efficient and accurate

Online transaction processing (OLTP): collecting data electronically and processing the

transactions online. Two ways transactions can be processed:

1. Operating in real time: transactions are entered and processed immediately on entry

2. Wait for many transactions to pile up before you process them

OLAP & the data resource challenge:

Online analytic processing (OLAP) also known as “decision support systems” (DSSs): systems

that focus on making OLTP-collected data useful for decision making

- Provides ability to sum, count, average, and perform other simple arithmetic operations on groups of data
- Format is dynamic: user can alter the format of the report
- Makes it possible to **drill down** into the data (divide data into more detail)
- A **measure** is the data item of interest → the presentation of a measure is known as a OLAP cube (or simply cube)

Data resource challenge: considering whether a company views its data as an asset
Is information a company asset?

- Data is a good asset → does not depreciate, does not take up much space, easy to store, provide input for decision making

BI systems & how they provide competitive advantage:

Business intelligence (BI) systems: 5 categories, characteristics and their competitive advantage

- BI: provides information for **improving** decision making

Business intelligence system Characteristics Competitive advantage:

improve decision making

by...

Group decision support
systems (GDSS)

Allow multiple decision
makers to collaborate, often
anonymously and in different
times/locations

Reducing biases that come
with group discussion and
option evaluation

Reporting systems integrate/process data by
sorting, grouping, summing

and formatting. Produce
administer and deliver reports
Provides relevant, accurate
and timely information to the
right person

Data-mining systems Use sophisticated statistical
techniques to find
patterns/relationships

RFM analysis: way of
analyzing/ranking customers
according to their purchasing
patterns

- How recently a
customer has ordered
- How frequently “ “
- How much \$ they
spend

By doing this, predicts future
outcomes

Knowledge management
systems

Share knowledge of product
uses, best practices, among
employees, managers,
customers, etc

By publishing employee &
other's knowledge. Create
value from existing capital.

Foster innovation, improve
customer service, increase
organizational

responsiveness, reduce costs

Expert systems Encode human knowledge in

the form of “if/then” rules
and process those rules to
make a

diagnosis/recommendation

By non-experts by encoding,
saving and processing expert
knowledge

Purpose & components of a data warehouse:

Purpose of a data warehouse: to extract and clean data from operational systems
and other

sources and to store and catalogue that data for processing by business intelligence
tools

Role of each component (8-7):

The difference between data mart & data warehouse:

Data mart: data collection that is created to address the needs of a particular
business function,
problem or opportunity

Data mark & data warehouses being part of the supply chain:

- Data warehouse can be seen as a distributor in a supply chain → takes data
from the data

manufacturers, cleans and processes it and locates it on warehouse computes

- Data mart can be seen as the retail store in a supply chain → is a data collection,
smaller

than the data warehouse, that addresses a particular component or functional area
of the
business

Typical data-mining applications:

Purpose of data-mining systems: application of statistical techniques to find
patterns and

relationships among data and to make classifications and predictions. Fall into 2
categories:

- Unsupervised data mining: analysts do not create a model/hypotheses prior to
running the

analysis; they create hypotheses after analysis to explain the patterns found

- **Cluster analysis:** unsupervised technique; statistical techniques identify groups of entities that have similar characteristics →e.g.: find groups of similar customers from customer order/demographic data

● Supervised data mining: analysts do create a model prior to analysis & apply statistical

techniques to data to predict the parameters of the model

- **Regression analysis:** measures the impact of a set of variables on another variable

- **Neural networks**

- **Market-basket analysis:** determines sales patterns; shows the products that customers normally buy together

Big data: large amounts of varied data from a variety of sources over a period of time could be

used to make better decisions

Chapter 9

E-commerce & how it is used

E-commerce: the buying and selling of goods and services over public and private computer

networks

● **Merchant companies** : take title to the goods they sell; they buy goods and resell them

● **Non-merchant companies:** do not take title to goods they sell; they buy goods and resell

them

Three main types of **merchant companies** :

1. Business-to-consumer (B2C): sell directly to consumers; retailer →to consumer
2. Business-to-business (B2B): sell to companies; distributor → retailer
3. Business-to-government (B2G): sell to government; retailer → government

Two main types of **non-merchant companies:**

1. E-commerce auctions: match buyers and sellers by using an ecommerce version of a

standard auction →e.g.: ebay

2. Clearing houses: provide goods and services at a stated price and arrange for the delivery

of goods, but they never take title → e.g.: Amazon.ca

- Electronic exchange: example of clearing houses → similar to stock exchange

Benefits of e-commerce:

- Disintermediation: the removal of intermediaries between parties → higher revenues for

manufacturers and lower cost for consumers

- Improves flow of price information → as a consumer, can go to a variety of websites that

offer product price comparisons

- Produces information about **price elasticity** (to seller) which is a measure of how much

demand rises/falls with changes in price

Challenges of e-commerce

- Channel conflict

- Price conflict

- Logistics expense: of entering and processing orders in small quantities

- Customer service expense

- Showrooming: occurs when customer learns/tries a product/service in retail store and

completes the sales transaction at the low-cost internet sales channel of another retailer

- Taxation

Social networking & how it is enabled/affected by IS/IT

Social network: a structure of individuals and organizations that are related to each other in some

way

Social networking: the process by which individuals use relationships to communicate with

others in a social network

- Social capital: earned through social networking

Three types of capital:

1. Physical capital: the investment of resources for future profit →e.g.: machines, manufacturing equipment, etc

2. Human capital: the investment in human knowledge and skills for future profit
→e.g.:

investing in education for good job

3. Social capital: investment in social relations with the expectation of returns in the marketplace → e.g.: when you attend a social event to meet people and enforce relationships. Adds value in four ways:

- Information: about opportunities, alternatives, problems and other factors
- Influence: provide an opportunity to influence decision makers in one's employer or in other organizations who are critical to your success
- Social credentials: being linked to a network of highly regarded contacts
- Personal reinforcement: being linked to social networks reinforces your professional image and position in organization

Do social networks add value to business?

- Organizations have social capital just as humans do
- Social capital is measured in the same way: number of relationships, strength of relationships, and resources controlled by friends
- Organizations maintain a presence on facebook, linkedin, pinterest → include links to their websites and make it easy for clients and interested parties to leave comments

How is social networking enabled by IS/IT?

1. Improved search capabilities: enable us to quickly sort through large amounts of data and

find the specific person or relationship that we are interested in

2. Reduction in the trade-off of richness and reach: the ability to keep track of many more

people and enhance personalization

3. Network effects: bigger network

Web 2.0

Web 2.0: the integration and interaction of products and services, such as smartphones,

user-created content, social networking, location and context-based services and dynamic

marketplaces

- Examples: google, amazon, eBay
- Do not sell software licenses because software is not their product
- Instead, provide software as a service (SAAS)
- No marketing done → *viral marketing*: new features are released and vendors wait for users to spread the word
- Value of the site increases with number of users & their use of the site

User-generated content (UGC): refers to website content that is contributed by users

Crowdsourcing: combines social networking, viral marketing, and open-source design, saving

considerable cost while cultivating customers

- Crowdfunding: start-up raises money from a large group of people who invest directly/prepay for a new good/service

Web 2.0 interfaces are organic → people find their way around Ebay and paypal

- Encourages **mashups** which result when the output from 2 or more websites is combined

into a single user experience → e.g.: Google My Maps

Web 2.0 is about participation **not** publishing → users provide reviews, map content, discussion

responses

Web 2.0 advertising → based on user interest

Not for all applications:

- Any information system that deals with assets (financial or material) requires some level of control
- E.g.: do not want to mash up credit card transactions on My Maps and share that mashup with the world

Chapter 10

How can information systems be acquired?

1. Buy it and use it as is
2. Buy it and customize it (most common method)
3. Rent or lease it
4. Build it yourself
5. Outsource it

What are IT Projects and define PMBOK?

Project management body of knowledge (PMBOK): defines what the project is. The guide to the

PMBOK suggests there are 5 process groups in a project:

1. Initiating
2. Planning
3. Executing
4. Controlling & monitoring
5. Closing

Any of these process groups can be related to one of the 9 project knowledge areas:

1. Integration management
2. Scope management
3. Time management
4. Cost management
5. Quality management
6. Human resources management
7. Communications management
8. Risk management
9. Procurement management

IT projects: projects that have a large IT component (in terms of budget or personnel); include

such things as the installation of a new email application, a CRM System, ERP etc

Information technology project management (ITPM): collection of techniques and methods that

project managers use to plan, coordinate, and complete IT Projects

What should you know about IT operations?

IT operations (IT services): the delivery of service, maintenance, protection and management of

IT Infrastructure are often accomplished as part of IT operations

Information technology infrastructure library (ITIL): well-recognized collection of books that

provide a framework of best-practice approaches to IT operations

Why are IT projects so risky?

IT Project risk:

- Lack of good model → project models are not that easy to represent graphically
- Precise estimates difficult to develop because the technology is continuously changing
- Being able to monitor progress

What is an SDLC?

Systems development life cycle (SDLC): classic process used to acquire information systems.

How are information systems designed, implemented and maintained?

5-phase process:

1. System definition

- Define system goals and scope
- Assess feasibility
 - Cost
 - Schedule
 - Technical: whether existing information technology is likely to be able to meet the needs of the new system
 - Organizational : concerns whether the new system fits within the organization's customs, culture, charter, or legal requirements
- Form project team
- Plan project

2. Requirements analysis: in which the project team is formed and requirements are developed

- Requirements team: usually consists of both IT personnel and user representatives
- Analysis work: often completed by business analysts
- Through acquiring an information system; the organization needs to match its requirements with the capabilities of **commercial off the shelf** (COTS) software

& may face discrepancies such as:

- Modify the software
- Modify the organizational procedures and data
- Live with the problem

3. Component design

- Determine hardware specifications
- Determine software specifications
- Design the database
- Design the procedures
- Create job definitions

For different types of software:

- Off-the-shelf software: team must determine candidate products and evaluate them against the requirements

- Off-the-shelf with alterations software: team identifies products to be acquired off

the self and determines the alterations required

- Customer-developed programs: team produces design documentation for writing program code

Procedures to be designed:

Users Operations personnel

Normal processing Procedures for using the system to accomplish

business tasks

Procedures for starting, stopping and operating the system

Backup User procedures for backing up data and other resources

Operations procedures for backing up data and other resources

Failure recovery Procedures to continue

operations when the
system fails

Procedures to convert back
to the system after
recovery

Procedures to identify the
sources of failure and get it
fixed

Procedures to recover and
restart the system

4. Implementation

- Build system components
- Conduct unit test
- Integrate components
- Conduct integrated test
- Convert to new system

System testing:

- Test plan: consists of sequences of actions that users take when using the new system → includes “normal actions” & “incorrect actions”
- Product quality assurance (PQA): consists of constructing the test plan with the advice and assistance of users
- Beta testing: process of allowing future users to try out the new system on their own

System conversion: process of converting business activity from the old to the new system. Can happen in 4 ways:

- Pilot: implementing system in a limited portion of the business → PRO: if the system fails, contained within a limited boundary, reduces business exposure & negative reputation

- Phased: new system is installed in phases across organization, once a given piece

works the organization installs/tests another piece of the system till it is entirely installed

- Parallel: new system runs in parallel with old system until it is fully operational

→ CON: expensive running both systems, PRO: easily go back to old system

● Plunge: shutting old system down completely & implementing new → CON: if new system does not work, nothing can be done till it is fixed or old system is reinstalled → **avoid plunge**

5. System maintenance

- Record requests for change: failures, enhancements
- Prioritize requests
- Fix failures:
 - Patches: fix security and other critical problems
 - Service packs: fix hundreds of thousands of problems
 - New releases

Problems with SDLC

Waterfall method: sequence of nonrepetitive phases

● Often there is a need to crawl back up the waterfall & repeat the work done in a prior

phase due to system malfunctions

Use → Agile method:

● More adaptable & gives developers time to work as requirements change which reduces

the risk of encountering problems

What is outsourcing, and what are application service providers?

Outsourcing: process of hiring another organization to perform a service

PROS CONS

- Easy way to gain expertise → developing expertise is expensive
- Cost reductions → hiring someone in china, india (low wages) or part-time outsourcing
- Reduce development risk → can cap financial risk by setting specific prices on components of the system
- Reduce implementation risk → reducing the risk of picking the wrong

hardware/software using the wrong network protocol or implementing incorrectly

- Loss of control

- Vendor in driver's seat
- Technology direction
- Potential loss of intellectual capital

- Product fixes, enhancements in wrong priority

- Vendor management, direction or identity changes

- Benefits outweighed by long-term costs

- High unit cost, forever
- Paying for someone else's management

- In time, outsourcing is the sole source

- May not get your money's worth

- No easy exit

- Critical knowledge in minds of vendors, not employees

- Expensive and risky to change vendors

Application service providers (ASPs): form of outsourcing where organization contracts with a

vendor to "rent" applications from the vendor company on a fee-for-service basis vs. traditional

outsourcing where the vendor maintains the systems at the organization's location

PROS CONS

- Vendor maintains system at their own

web location → reduces the costs of supporting the application for the

organization

- Loses physical control over some corporate data store in vendor's machines
- Any internet failure means that client company cannot operate, even internally
- Potential for lock in the ASP→may not allow corporate data to be easily ported to competing vendor's sites

Chapter 10: 10a → MS

Chapter 11

How is the IT department organized?

Chief executive officer (CEO)/Chief Operating Officer (COO)

HR Legal & other staff functions

VP Marketing

VP Sales

VP Manufacturing

Chief information officer (CIO) *principal manager* – Data administration

Chief financial officer (CFO)

VP Engineering

Technology (CTO) *heads technology group*

Operations: *manages computing infrastructure (individual computers, computer centres, networks and communications media)*

Development: *manages projects that acquire new info. Systems + maintains existing info.*

Systems

Outsourcing relations: *present when organization has outsourcing agreements*

What is IT architecture?

Competitive strategy: supported by activities (collection of business processes supported by information systems) in the value chain

IT architecture: basic framework for all the computers, systems and information management

that support organizational services

- Complex → therefore some organizations hire a **enterprise architect**, person who creates a *blueprint* of an organization's information systems and the management of these

systems

- Blueprint → provides an overview that helps people in the organization better understand

current investments in technology and plan for changes

Zachman framework (for IT architecture) *figure 11-4

- Divides systems into 2 dimensions:

1. Based on six reasons for communication (what (data), how (function), where (network), who (people), when (time), why (motivation))
2. Stakeholder groups: planner, owner, designer, builder, implementer and worker

What is alignment, the importance of it, and the difficulties of it?

Alignment: process of matching organizational objectives with IT architecture

- Importance: studies show that the alignment improves perceived business performance →

when technology is aligned with some strategic objectives

- Challenges: fitting architecture to business objectives is continually evolving

What is information systems government?

Information systems government:

- Governance: development of consistent, cohesive management policies and verifiable

internal processes for information technology and related services

- Goal for ISG: improve the benefits of an organization's IT investment over time

- ISG = piece of organizational governance that is associated with IT architecture

- Increasing interest in ISG is the results of laws **sarbanes-oxley act (sox) & bill 198** (also

known as “ **budget measures act** ”

What is an information systems audit?

Information systems audit: focused on information resources that are used to collect, store,

process and retrieve information →establishing methods for examining and verifying

organization's information systems policies and procedures

- **Information systems audit and control association** : responsible for auditing for newly

developed computer systems

Information systems ethics:

- Not about hardware/software → but about people involved in the system
- Details appropriate rules for our behaviour & understanding our own behavior

What is Green IT?

Green IT: using IT resources to better support the *triple bottom line* (includes measures of

traditional profit along with ecological and social performance) for organizations

- Primary goal: improve energy efficiency, promote recyclability, reduce the use of materials that are hazardous to the environment

- Considers the financial implications of adopting/using IT but also the effects of those

choices on people and the environment

- Example: ENERGY STAR program → intended to produce equipment that meets high-energy efficiency specifications or promotes the use of such equipment

Issues in green IT:

- E-cycling: recycling of electronic computing devices
- E-waste industry

Chapter 12

What is identity theft?

Identity theft: vital information (person's name, d.o.b, sin, mother's maiden name) used to

facilitate impersonation → with this info, identity theft can open bank accounts, take luxury

trips, apply for loans/credit cards, under person's name

What is PIPEDA?

Personal information protection and electronic document act (PIPEDA): intended to balance

an individual's right to the privacy of their personal information with an organization's need to

collect, use and share that personal information for business purposes

What types of security threats do organizations face?

Three sources of security threats:

1. Human error and mistakes: caused by both employees and others external to organization
2. Malicious human activity: hackers, viruses, spam, employees who intentionally destroy data or other system components
3. Natural events and disasters: tsunami, hurricane, earthquakes

Five types of security problems:

1. Unauthorized data disclosure
2. Incorrect data modification
3. Faulty service
4. Denial of service
5. Loss of infrastructure

Source

Problem Human error Malicious human activity Natural events and disasters

Unauthorized

data disclosure:

Can occur due to

human error

when someone

inadvertently

releases data in

violation of

policy

Procedural mistakes ● Pretexting: occurs when someone deceives by

pretending to be someone

else → fake credit card caller

● Phishing: pretexting via email

- Spoofing: someone pretending to be someone or somewhere else

- Sniffing: intercepting computer communications

- Computer crime

Disclosure during recovery

Incorrect data

modification

- Procedural

mistakes

- Incorrect

procedures

- Ineffective

accounting

controls

- System errors

- Hacking: person gains

unauthorized access to a

computer system

- Computer crime

Incorrect data

recovery

Faulty service:

problems that

result because of

incorrect system

operation

- Procedural

mistakes

- Development

and

installation

errors

● Computer crime

● Usurpation

Service

improperly

restored

Denial of

service: usually

occurs due to

human error in

Accidents DOS attacks: denial of service

attacks

Service

interruption

following

procedure or lack

of procedure

Loss of

infrastructure:

Due to human

accidents

Accidents ● Theft

● Terrorist activity

Property loss

Elements of a security program:

1. Senior management involvement

2. Safeguards of various kinds

3. Incident response

How can technical safeguards protect against security threats?

Technical safeguards: involve the hardware and software components of an information system

Protect by:

- Identification and authentication: e.g.: username (identifies), password (authorizes).

Authentication method fall into 3 categories

- What you know (password/PIN)

- ☐ Use of smart card requires **PIN** (personal identification number)

- ☐ **Challenge-response** authentication: new password is generated at each login by an algorithm stored in the chip

- What you have (smart card)

- ☐ Smart card: plastic card with microchip that is loaded with identifying data

- What you are (biometric)

- ☐ **Biometric authentication:** uses personal characteristics (fingerprints, facial features, retinal scans) to authenticate users

- Encryption

- Firewalls

- Malware protection: includes viruses, worms, trojan horses, spyware (installed on user's

computer without their knowledge/permission) and adware (installed without user's permission and resides in the background to observe user's behavior)

- Design for secure applications

Malware safeguards:

- Install antivirus and anti-spyware programs

- Set up your anti-malware programs to scan you computer frequently

- Update **malware definitions:** patterns that exist in malware code

- Open email attachments from only known sources

- Promptly install software updates from legitimate sources

- Brown only in reputable internet neighbourhoods

How can data safeguards protect against security threats?

Data safeguards: protect databases and other organizational data

Two organizational units are responsible for data safeguards:

1. Data administration: organization-wide function that is in charge of developing data

policies and enforcing data standards

2. Database administration: a function that pertains to a particular database

Both data administration & database administration help:

- Define data policies
- Data right and responsibilities
- Rights enforced by user accounts authenticated by passwords
- Data encryption
- Backup and recovery procedures
- Physical security

How can human safeguards protect against security threats?

Human safeguards: involve the people and procedures components of information system

→generally, human safeguards result when authorized users follow appropriate procedures for system use and recovery

Human safeguards for employees:

- Position definition:
 - Separate duties and authorities
 - Determine least privilege
 - Document position sensitivity
- Hiring and screening
- Dissemination and enforcements: responsibility, accountability, compliance
- Termination: friendly, unfriendly

Human safeguard for non-employees:

- **Hardening:** hardening a site means to take extraordinary measures to reduce a system's vulnerability

Human safeguard for account administration: administration of user accounts, passwords, and help-desk policies and procedures –account management, password management

System Procedures

System users Operations personnel

Normal operation Use the system to perform job tasks, with security appropriate to sensitivity

Operate data centre
equipment, manage networks,
run web servers, and do
related operational tasks

Backup Prepare for loss of system
functionality

Back up website resources,
databases, administrative
data, account and password
data and other data

Recovery Accomplish job tasks during
failure → know tasks to do
during system recovery

Recover systems from
backed-up data, perform role
of help desk during recovery

Human safeguard for security monitoring: important monitoring functions are
analysis of *activity*

logs, security testing and investigating/learning from security incidents

What is disaster preparedness?

Disaster preparedness guidelines:

- Locate infrastructure in safe location
- Identify mission-critical systems
- Identify resources needed to run those systems
- Prepare remote backup facilities

- **hot spots:** remote processing centres, provide all equipment needed to continue
operations in case of disaster

- **Cold sites:** provide space and limited technology & customers provide and install
the equipment necessary to continue operations after disaster

- **Warm sites:** somewhere in the middle

- Train and rehearse

How should organizations respond to security incidents?

Factors in incidence response:

- Have plan in place
- Centralized reporting: enable organization to determine whether it is under systematic attack of whether an incident is isolated
- Specific responses: speed, preparation pays, don't make problem worse
- Practice

==How can organizations improve processes?

OMIS model

1 objectives

- Classify objectives as effectiveness or efficiency
- Make objectives explicit
- Obtain agreement about objectives
- Ensure that objectives are not vague or inappropriate

2 Measure

Ensure that measures are

1Reasonable2Accurate3Consistent

3 IS

- Improve efficiency or effectiveness of activities
- Provide linkages across activities
- Improve control of the process

==How can SOA improve processes

/SOA: Services-Oriented Architecture

- Middleware facilitates communication and data sharing
- Design approach for activities bases on
- 1service 2 encapsulation 3 standards

/Service

- repeatable task that a business needs to perform

/Encapsulation

- Hides data within containers so that services can communicate

/Standards

- Standardized formats for data exchange

==EAI(enterprise application integration) does the following:

- Connects infor silos via a new layer of software
- enables existing applications to communicate and share data
- provides integrated data
- leverages existing systems, leaving departmental information systems as is, but providing an integration layer over the top
- enable a gradual move to ERP

==ERP

- integrates data and supports processes across departmental areas
- uses a single database

- is a single information system
- accounting/HR/sales/operations
- ==benefits of ERP
- Implements processes that are industry best practices
- Data sharing occurs in real time
- Management can be more insightful and provide better oversight
- The information silo problem is solved
- reduce inventory/reduce costs/reduce returns/reduce end-of-year closing time/volume of cross-selling/

==challenge---implementation decision/people issue (resist changes)/

==what problems with the procurement process before SAP.

Warehouse problems(growth in finished goods inventory/limited space for raw materials/lack of visibility into price discounts)

Accounting pro(three-way match for payment was a challenge/correcting discrepancies were labor intensive/time delays in updating accounting data)

Purchasing pro(purchasing wasn't centralized/inexperienced users/errors in data entry/pressure for greater financial controls)

Porter's five forces(bargaining power of customers/bargaining power of suppliers/threat of new entrants/threat of substitute products or service/intensity of competitive rivalry)

Porter's value chain model primary activities(inbound logistics/operations/outbound logistics/marketing and sales/service)

Porter's value chain model support activities(Firm infrastructure/HR/technological development/procurement)

Competitive strategies(cost leadership across industry/cost leadership focus on particular segment/differentiation across industry/differentiation focused on particular industry segment)

Reason for outsourcing(easy way to gain expertise/cost reduction/reduce development risk)

Risk for outsourcing(loss of control/benefits outweigh by long-term cost/no easy exit)

Norrie, Huber, Piercy, McKeown

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Chapter 1

1. Globalization suggests that modern businesses are using information technology to:

- a) expand their market to customers around the globe
- b) find the lowest-cost suppliers regardless of location
- c) create 24 hour business days by shuttling work across time zones
- d) broaden the range of business activities across multiple nations
- *e) all of the above

2. Moore's Law states that computing power roughly doubles every:

- a) 18 days
- b) 18 weeks
- *c) 18 months
- d) 18 years

3. When considering explicit knowledge and tacit knowledge:

- *a) explicit knowledge is readily codified and tacit knowledge is gained through experience
- b) explicit knowledge is gained through experiences and tacit knowledge is readily codified
- c) explicit knowledge is rarely required by knowledge-enabled professionals and tacit knowledge is referenced in text books
- d) explicit knowledge is more important to knowledge-enabled professionals and tacit knowledge is much less important and rarely used

4. Which of the following are types of information systems?

- *a) MIS, TPS, DSS
- b) URL, HTTP, XML
- c) HTML, ASCII, WWW
- d) UML, USB, SCM

5. Business value is:

- a) the price structure of a firm's goods and services
 - *b) the positive return on the investment of a firm's resources
 - c) derived from a firm's marketing/promotional strategy
 - d) the cost of implementing successful information systems within a firm
6. When considering data and information:
- *a) data is a collection of unorganized facts and information is data that has been transformed into something useful
 - b) data is unimportant and businesses should only consider information

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- c) data is critical when developing a solution to a problem while information should be considered only occasionally
 - d) data and information refer to the same thing
7. The Internet is:
- a) a global computer system that is ultimately controlled by the U.S. government
 - b) a global computer system that is reaching its current potential and is expected to decline in use during the next decade
 - *c) a large number of co-operating computer networks that use a common set of rules for sending messages
 - d) a large number of computer systems that are inherently in conflict resulting in an inefficient use of the world's resources
8. The Internet generates business value by:
- *a) enabling the buying and selling of goods
 - b) protecting domestic markets from foreign competition
 - c) promoting trade barriers in areas of the world that are underdeveloped
 - d) ensuring compliance of government legislation regarding foreign investment
9. Information security systems protect:
- a) people
 - b) information
 - c) networks
 - d) organizations
 - *e) all of the above
10. Allowing companies to take their operations to another location, which allows them to produce items better, faster, and cheaper defines:
- *a) offshoring
 - b) insourcing
 - c) open sourcing
 - d) informing
 - e) none of the above
11. Globalization has affected businesses in all of the following ways **except**:
- a) marketing to new customers
 - *b) understanding company grapevine

- c) finding new suppliers
- d) creating 24-hour workdays
- 12. The Internet has become an integral part of business for which of the following key reasons?
 - a) communication, knowledge, and information
 - b) communication, knowledge, and commerce
 - *c) communication, information, and commerce
 - d) information, commerce, and knowledge
 - e) information only

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- 13. Using Internet technologies to allow work to be done without human intervention refers to:
 - *a) workflow software
 - b) offshoring
 - c) insourcing
 - d) open sourcing
 - e) none of the above
- 14. When information systems are used to integrate people, information, technology, and business processes, you have created:
 - *a) business value
 - b) relevance
 - c) knowledge
 - d) information
 - e) wisdom
- 15. The kind of work that uses discovery, transformation, analysis, synthesis, and communication skills is called _____ work.
 - a) business value
 - b) relevant
 - *c) knowledge
 - d) information
 - e) wisdom
- 16. The knowledge process includes which two types of knowledge?
 - a) discovery and analysis
 - *b) explicit and tacit
 - c) synthesis and transformation
 - d) ethical and practical
 - e) right and wrong
- 17. If you use a podcast to acquire knowledge, what type of knowledge have you acquired?
 - a) ethical
 - b) practical
 - *c) explicit
 - d) tacit
 - e) analytical

18. If you use a software manual to acquire information about its advanced functions, you have acquired _____ knowledge:

- a) ethical
- b) practical
- *c) explicit
- d) tacit
- e) analytical

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19. If you use an expert opinion to acquire information about advanced features of a software package, you have acquired _____ knowledge:

- a) ethical
- b) practical
- c) explicit
- *d) tacit
- e) analytical

20. When a system has been designed to transform inputs into outputs in order to achieve a goal, the system is called a(n) _____ system.

- a) computer
- b) business
- c) knowledge
- d) technology
- *e) information

22. The Input-Process-Output model is designed to accomplish all of the following **except**:

- a) achieve business goals
- b) apply appropriate use of technology
- c) delivery timely information
- *d) create entertainment
- e) enhance knowledge work

23. _____ is/are added when IS and IT are used to support the goals of the organization.

- *a) Business value
- b) Information
- c) Knowledge
- d) Data
- e) Wisdom

24. You have been asked to create a database of customers for a small, start-up company. Which part of an information system will you begin with?

- a) process
- b) people
- *c) input
- d) output
- e) distribution

25. Your supervisor has asked you for a monthly list of overall sales, by region, and by sales representative. Which part of an information system does this request illustrate?

- a) process
- b) people
- c) input
- *d) output
- e) distribution

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26. Using the monthly list of sales, by region, and by sales representative, you discover that a helpful report would be to add year to date sales. Which part of an information system does your insight illustrate?

- *a) process
- b) people
- c) input
- d) output
- e) distribution

27. Capturing and processing online order transactions is an example of a(n) _____ system.

- *a) TPS
- b) MIS
- c) DSS
- d) ERP
- e) CRM

28. Providing timely information to decision makers is an example of a(n) _____ system.

- a) TPS
- *b) MIS
- c) DSS
- d) ERP
- e) CRM

29. Integrating and analyzing customer transactions data is an example of a(n) _____ system.

- a) TPS
- b) MIS
- c) DSS
- d) ERP
- *e) CRM

30. Integrating and standardizing processes to store and manage data is an example of a(n) _____ system.

- a) TPS
- b) MIS
- c) DSS
- *d) ERP
- e) CRM

31. A system that enables data-based decisions that lead to new business opportunities is an example of a(n) _____ system.

- a) TPS
- b) MIS
- *c) DSS
- d) ERP
- e) CRM

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32. Illegal use of obtaining financial information on the Internet is called:

- a) spamming
- *b) phishing
- c) trolling
- d) blogging
- e) scamming

33. IS security systems in an organization provide protection for all of the following **except**:

- a) data
- b) information
- c) people
- d) networks
- *e) wisdom

34. Of the 10 forces identified by Friedman as responsible for flattening the world, only one is not directly related to technology. Which is it?

- *a) collapse of the Berlin Wall
- b) open sourcing
- c) offshoring
- d) supply-chaining
- e) none of the above

35. When a person uses experience, information, and judgment, he/she is using:

- *a) knowledge
- b) data
- c) systems
- d) wisdom

36. Textbooks, websites, and monthly sales reports are examples of _____ knowledge.

- *a) explicit
- b) process
- c) output
- d) tacit
- e) none of the above

37. Experience, insight, discovery, and wisdom are examples of _____ knowledge.

- a) explicit
- b) process

- c) output
 - *d) tacit
 - e) none of the above
38. Which of the following sequences is correct?
- a) knowledge-information-data
 - b) information-knowledge-data
 - c) data-knowledge-information

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- *d) none of them are correct
39. You needed to purchase a new computer system for your office. You have narrowed down your choices from several alternatives. This is an example of a(n):
- a) input
 - b) output
 - *c) decision
 - d) knowledge
 - e) wisdom
40. A(n) _____ system integrates and standardizes processes, and centralizes and standardizes the storage and management of data.
- a) MIS
 - b) DSS
 - c) CRM
 - *d) ERP
 - e) none of the above
41. When we refer to a business, we mean an organisation with one or more people who:
- A) decide on common goals to pursue
 - B) work together to locate and organize resources
 - C) create processes in order to achieve the desired goals
 - *d) all of the above
 - E) none of the above
42. Globalization means:
- a) that modern businesses are using information technology to expand their market
 - b) to find the lowest cost suppliers regardless of location
 - c) to create 24 hour business days by shovelling work across time zones and nations
 - *d) all of the above
 - e) none of the above
43. A(n) _____ provides analytical and visualization tools to support and enhance decision making and planning.
- a) MIS
 - *b) DSS
 - c) CRM
 - d) ERP

- e) none of the above
- 44. Chose the statement that is the most accurate.
 - *a) The World Wide Web runs over the Internet.
 - b) The Internet runs over the World Wide Web.
 - c) The Internet runs over an intranet.
 - d) The World Wide Web Runs over an intranet.

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- 45. Through processing and reporting features, a(n) ____ provides timely information to decision makers.
 - *a) MIS
 - b) DSS
 - c) CRM
 - d) ERP
 - e) none of the above
- 46. ____ knowledge describes information that you gain through experience.
 - a) Coded
 - *b) Tacit
 - c) Explicit
 - d) Learned
 - e) None of the above
- 47. A _____ is the exchange of something of value the business produces for something in return that the business values:
 - *a) transaction
 - b) process
 - c) trade
 - d) currency
- 48. Knowledge work:
 - a) is a career in information technology
 - *b) can be found in any industry
 - c) is only in the field of library studies
 - d) none of the above
- 49. Which of the following concepts describes the flow through an information system?
 - a) discovery, analysis, transformation, synthesis and communication
 - b) input, output, process
 - c) data, information, knowledge
 - d) all of the above
 - *e) none of the above
- 50. IS security is also known as:
 - *a) information assurance
 - b) information insurance
 - c) information security

- d) antivirus
 - e) none of the above
51. An example of phishing is:
- a) fishing for a rare type of animal
 - b) cold-calling customers for new business
 - *c) attempting to gain logins and passwords

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- d) none of the above
52. According to Arti Davda of Google Canada, what is an important career skill?
- a) to know a little bit about everything
 - b) to build your network of contacts
 - c) to be a specialist in your field
 - *d) to be flexible and to easily adapt to change
53. Organizations and individuals must keep up with these rapid technology changes or risk becoming:
- a) perfect
 - b) successful
 - *c) obsolete
 - d) forgotten
54. VLSI stands for:
- a) very low-scale integration
 - *b) very large-scale integration
 - c) varying low-scale integration
 - d) varying large-scale integration
55. MIS stands for:
- a) minimized information systems
 - b) maximized information systems
 - *c) management information systems
 - d) monetary information systems
56. According to the text, in today's work environment, it's impossible to do knowledge work without:
- *a) technology
 - b) information
 - c) knowledge
 - d) money
 - e) all of the above
57. Who said, "Success is a lousy teacher. It seduces smart people into thinking they can't lose."
- *a) Bill Gates
 - b) Michael Porter
 - c) Thomas Friedman
 - d) Steve Jobs

e) None of the above

58. An information system (IS) is an organized collection of:

- a) people, transformation, business processes, and communication
- b) people, information, business processes, and communication
- *c) people, information, business processes, and information technology

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d) people, transformation, business processes, and information technology

59. An information system (IS) is designed to:

- a) inform outputs about inputs in order to achieve a goal
- b) inform inputs about outputs in order to achieve a goal
- c) transform outputs into inputs in order to achieve a goal
- *d) transform inputs into outputs in order to achieve a goal

60. Information systems enhance:

- a) work, discussion, problem solving, communicating, and coordinating
- b) work, discussion, problem solving, information, and coordinating
- c) work, decision making, problem solving, information, and coordinating
- *d) work, decision making, problem solving, communicating, and coordinating

61. IPO model stands for:

- a) information-process-output
- *b) input-process-output
- c) information-people-output
- d) input-people-output

62. A business should design its information system to leverage the _____ ability to use information technology to its best advantage.

- *a) human
- b) financial
- c) environmental
- d) technological

63. Input items entered into a system are transformed into:

- *a) outputs
- b) processes
- c) goals
- d) none of the above

64. Putting your friends' contact information into your contact list is an example of:

- *a) input
- b) data
- c) outputs
- d) information

65. A series of one or more steps used by a business to transform inputs into outputs describes:

- a) input
- *b) process

- c) outputs
- d) none of the above

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66. A collection of steps that interact with each other to transform inputs into outputs to achieve a goal:
- a) technology processes
 - b) human processes
 - c) financial processes
 - *d) business processes
67. A choice made from one or more alternatives to follow or avoid some course of action is a(n):
- a) option
 - b) risk
 - *c) decision
 - d) mistake
68. A positive ROI of resources created through the effective and efficient integration of an organization's people, information, information technology, and business processes creates:
- *a) business value
 - b) successes
 - c) goals
 - d) profit
 - e) none of the above
69. The _____ is created at the intersection of people, process, and technology.
- a) cross zone
 - *b) productivity zone
 - c) hierarchy
 - d) pyramid
70. Microsoft Groove, Microsoft SharePoint, and Blackboard are examples of:
- *a) collaboration software
 - b) portals
 - c) data warehouses
 - d) gateways
71. _____ generates business value by making it possible for professionals to share information both between themselves and with business partners.
- a) cooperation
 - b) collaboration
 - c) commerce
 - *d) communication
72. The Internet generates value by being an avenue for the buying and selling of goods, also known as:
- a) eBay

- *b) commerce
- c) auction

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d) reverse auction

73. CRM stands for:

- a) customer retention management
- *b) customer relationship management
- c) class relationship management
- d) class retention management

74. ERP stands for:

- a) enterprise risk planning
- *b) enterprise resource planning
- c) enterprise retention planning
- d) enterprise rotation planning

75. DSS stands for:

- *a) decision support systems
- b) decision service systems
- c) decision supply systems
- d) decision success systems

76. TPS stands for:

- a) transaction portal system
- b) transaction paging system
- c) transaction project system
- *d) transaction processing system

77. Features such as email, meeting facilitation, and group scheduling are examples of:

- a) collaboration software
- *b) groupware
- c) productivity software
- d) middleware
- e) none of the above

78. The concept of Moore's Law is:

- a) everything that can go wrong will
- *b) computing power roughly doubles every 18 months
- c) always have a backup plan
- d) the 80/20 rule
- e) none of the above

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Chapter 2

1. Clock speed on a computer is measured most recently in:
 - a) Megahertz (MHz)
 - *b) Gigahertz (GHz)
 - c) Megabytes (MB)
 - d) Gigabytes (GB)
 - e) None of the above
2. Higher clock speeds usually mean ____ performance.
 - *a) faster
 - b) slower
 - c) worse
 - d) better
3. ____ temporarily locates data and instructions before processing.
 - *a) Memory
 - b) CPU
 - c) Keyboard
 - d) Mouse
 - e) None of the above
4. Computers have long-term memory called:
 - *a) ROM
 - b) RAM
 - c) KB
 - d) GB
 - e) None of the above
5. ROM stands for:
 - a) read only management
 - b) random only management
 - *c) read only memory
 - d) random only memory
6. ____ contains instructions and data that only special devices can alter.
 - *a) ROM
 - b) RAM
 - c) KB
 - d) GB

hzzled

- e) None of the above
7. ____ stores data only until they are no longer needed, or until you shut down the computer.
- a) ROM
 - *b) RAM
 - c) KB
 - d) GB
 - e) None of the above
8. RAM stands for:
- a) random access management
 - b) read access management
 - *c) random access memory
 - d) read access memory
9. PDA stands for:
- a) professional digital assistant
 - b) programming digital assistant
 - *c) personal digital assistant
 - d) portable digital assistant
10. Keyboards, pointing devices (such as a Wii remote, mouse, or touchpad), scanners, and digital cameras are examples of:
- *a) input devices
 - b) output devices
 - c) processing devices
 - d) storage devices
 - e) none of the above
11. Computer monitors, printers, speakers and MP3 players are examples of:
- a) input devices
 - *b) output devices
 - c) processing devices
 - d) storage devices
 - e) none of the above
12. Examples of ____ include the computer hard drive, CDs, DVDs, USB flash memory, and external hard drives
- a) input devices
 - b) output devices
 - c) processing devices
 - *d) storage devices
 - e) none of the above
13. _____, both wired and wireless, allow you to connect to a remote network over a telecommunications line, such as the telephone or cable TV service.

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- a) Routers
- b) Bridges
- c) Switches
- d) Hubs
- *e) Modems

14. The digital signals going out from your computer into an analog signal appropriate for the connection medium used is called:

- *a) modulation
- b) demodulation
- c) conversion
- d) none of the above

15. Converting an analog signal back into a digital signal that your computer can recognize is called:

- a) modulation
- *b) demodulation
- c) conversion
- d) none of the above

16. BPS stands for:

- a) bytes per second
- b) blips per second
- *c) bits per second
- d) beeps per second

17. You can think about _____ as information that specifies how a hardware device should work with other data, information, and knowledge.

- a) instructions
- b) operating system
- *c) software
- d) drivers

18. The _____ software coordinates and handles the details of working with the computer hardware.

- a) instruction
- *b) operating system
- c) driver
- d) utility

19. _____ software provides additional tools that you can use to maintain and service your system

- *a) Utility
- b) Driver
- c) Operating system
- d) Application

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e) None of the above

20. A(n) ____ application is an example of utility software that helps guard your computer against unauthorized access when connected to a network.

a) driver

*b) firewall

c) antivirus

d) malware

21. ____ software is a complete, self-contained program or set of programs for performing a specific job.

a) Utility

b) Driver

c) Operating system

*d) Application

e) None of the above

22. Microsoft Word is an example of:

*a) document preparation software

b) electronic spreadsheet software

c) presentation graphics software

d) database management system

e) none of the above

23. Microsoft Excel is an example of:

a) document preparation software

*b) electronic spreadsheet software

c) presentation graphics software

d) database management system

e) none of the above

24. Microsoft PowerPoint is an example of:

a) document preparation software

b) electronic spreadsheet software

*c) presentation graphics software

d) database management system

e) none of the above

25. Microsoft Access is an example of:

a) document preparation software

b) electronic spreadsheet software

c) presentation graphics software

*d) database management system

e) none of the above

26. Microsoft Outlook is an example of:

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- a) document preparation software
 - b) electronic spreadsheet software
 - c) presentation graphics software
 - d) database management system
 - *e) none of the above
27. An example of a personal information management system is:
- a) Microsoft Word
 - b) Microsoft Excel
 - c) Microsoft PowerPoint
 - d) Microsoft Access
 - *e) None of the above
28. _____ is/are software that is more common in enterprises. Its purpose is to link applications that use dissimilar software or hardware platform.
- a) Utility software
 - *b) Middleware
 - c) Open source software
 - d) Drivers
29. _____ software is software that can be used, modified, improved, and redistributed.
- a) Utility
 - b) Middleware
 - *c) Open source
 - d) Driver
30. Today, the fastest-growing network is arguably our global computer network, known as the:
- *a) Internet
 - b) extranet
 - c) intranet
 - d) none of the above
31. A computer network requires four primary components. Which of the following is NOT one of them?
- a) data that computers share on the network
 - b) special hardware
 - c) software that allows computers to communicate
 - d) communication media to link the computers together
 - *e) none of the above
32. A _____ area network covers a very small space that ranges from the size of a human body to a small office.
- *a) personal
 - b) local
 - c) wide
 - d) municipal

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e) none of the above

33. A ____ area network is within the immediate location or building.

a) personal

*b) local

c) wide

d) municipal

e) none of the above

34. POTS stands for:

a) plain original telephone system

b) plain original telecom system

*c) plain old telephone system

d) plain old telecom system

35. A ____ connects, translates, and then directs data that cross between two networks.

*a) router

b) hub

c) repeater

d) bridge

36. A ____ serves as a central connection point for cables from the devices on the network.

a) router

*b) hub

c) repeater

d) bridge

37. A ____ is also known as a concentrator.

a) router

*b) hub

c) repeater

d) bridge

38. A _____ is sometimes needed to strengthen or amplify signals that are sent along a long transmission route.

a) router

b) hub

*c) repeater

d) bridge

39. The Internet is sometimes known as a ____ area network.

a) personal

b) local

c) wide

d) municipal

*e) none of the above

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40. Servers are often assigned a specific task, such as handling Web traffic. What is this type of server called?

- *a) web server
- b) application server
- c) gateway server
- d) firewall server

41. Servers are often assigned a specific task, such as running programs. What is this type of server called?

- a) web server
- *b) application server
- c) gateway server
- d) firewall server

42. A _____ is a standard set of rules that allows the communication of data between nodes on a network.

- a) moral
- b) code
- *c) protocol
- d) ethic

43. The Internet uses the _____ suite of packet switching protocols

- a) HTML
- b) XML
- c) VoiP
- *d) TCP/IP

44. Who owns the Internet?

- a) Internet Engineering Task Force (IETF)
- b) The Internet Architecture Board (IAB)
- c) The World Wide Web Consortium (W3C)
- *d) None of the above

45. ISP stands for:

- a) Internet supply provider
- *b) Internet service provider
- c) Internet server provider
- d) Internet support provider

46. ____ is the popular name for 802.11 standards for wireless network access.

- *a) Wi-Fi
- b) VoIP
- c) Cloud
- d) TCP/IP

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47. _____ uses the Internet's foundation technologies of packet switching and TCP/IP to carry voice instead of data.
- a) Wi-Fi
 - *b) VoIP
 - c) Cloud
 - d) TCP/IP
48. _____ computing simply means computing over the Internet.
- a) Wi-Fi
 - b) VoIP
 - *c) Cloud
 - d) TCP/IP
49. There are several benefits to cloud computing. Which of the following is NOT one of them?
- a) reduced cost
 - b) scalability
 - c) accessibility
 - *d) limited
50. The Internet is currently using IPv4. What is the next version that will be employed?
- *a) IPv6
 - b) IPv4.1
 - c) IPv5
 - d) None of the above
51. A static web page file will typically hold a combination of text content and _____ commands
- *a) HTML
 - b) JavaScript
 - c) Ajax
 - d) C+
52. A _____ is a software application that allows you to easily navigate the Web and to view the content that you find there.
- a) web server
 - *b) web browser
 - c) search engine
 - d) none of the above
53. The _____ comprises the set of rules for exchanging messages on the World Wide Web.
- a) FTP
 - b) XML
 - *c) HTTP
 - d) TCP/IP
54. Who is known as the inventor of the World Wide Web?
- *a) Tim Berners-Lee

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- b) Bill Gates
 - c) Steve Jobs
 - d) Thomas L. Friedman
 - e) None of the above
55. HTTP lives at the ____ layer of networks.
- *a) application
 - b) presentation
 - c) network
 - d) data link
 - e) none of the above
56. ____ is the primary language for creating web pages.
- *a) HTML
 - b) JavaScript
 - c) Ajax
 - d) C+
57. ____ move around from site to site, read meta tags, and report the data back to their database for storage.
- *a) Spiders
 - b) Metasearch engines
 - c) Crabs
 - d) Web browsers
58. Another term for crawlers is:
- *a) spiders
 - b) metasearch
 - c) crabs
 - d) queries
59. A ____ sends out a search query to other search engines, and then returns the list to you.
- *a) metasearch engine
 - b) spider
 - c) SQL
 - d) crawler
60. ____ refers to fixed information, such as company information, online marketing, and electronic versions of company brochures.
- a) User content
 - b) Automatic content
 - *c) Static content
 - d) Dynamic content
61. Which technology is indicative of first-generation e-commerce?
- a) user content

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b) automatic content

*c) static content

d) dynamic content

62. With _____, information on a web page can change depending on a number of factors.

a) user content

b) automatic content

c) static content

*d) dynamic content

63. A _____ is a small bit of data, usually created by programs running on the server, stored on the client machine, and passed back and forth in the HTTP request and response.

*a) cookie

b) bit

c) byte

d) code

64. When data remain available for a period of time, it is known as _____ data

*a) persistent

b) permanent

c) temporary

d) imminent

65. The most common client-side scripting language is:

*a) JavaScript

b) AJAX

c) AdobeScript

d) ActiveX

66. With server-side programming, a business can do many things. Which of the following is NOT one of them?

a) deliver content that it customizes for the individual user

b) access data stored in a server-side database and send it to the client's browser

c) optimally manage the traffic to the site

*d) none of the above

67. Which of the following is NOT one of the four primary components of a typical ecommerce site?

a) the shopping and ordering system

*b) the customer account

c) the payment gateway

d) the security system

68. A _____ is a company that provides a network to process encrypted transactions from a merchant's website.

*a) secure gateway provider

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- b) Internet service provider
 - c) payment gateway
 - d) firewall service
69. A ____ links an e-commerce site with the banking network.
- a) secure gateway provider
 - b) Internet service provider
 - *c) payment gateway
 - d) firewall service
70. A server that encrypts data using the SSL protocol is known as a:
- *a) secure server
 - b) gateway server
 - c) firewall
 - d) network server
71. SSL is currently being replaced by a newer protocol called the:
- a) HTTP
 - b) XML
 - c) VoiP
 - *d) TLS
 - e) SET
72. We are currently in the ____ generation of e-commerce.
- a) first
 - b) third
 - *c) fourth
 - d) fifth
 - e) sixth
73. ____ is a standardized way for one computer program to request and run another computer program over the Internet.
- *a) A web service
 - b) A protocol
 - c) Software as a Service
 - d) A mashup
74. ____ is a web application that seamlessly combines information from more than one source into an integrated experience.
- a) A web service
 - b) A protocol
 - c) Software as a service
 - *d) A mashup
75. The use of malicious code as part of a subversive, organized scheme is called:
- *a) malware

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b) scareware

c) virus

d) worm

76. A type of malware designed to trick victims into purchasing and downloading useless and potentially dangerous software is called:

a) malware

*b) scareware

c) virus

d) worm

77. A program that is able to copy itself and infect a computer is called:

a) malware

b) scareware

*c) virus

d) worm

78. Once started on a computer (by clicking an email attachment), it automatically sends out infected emails to everybody in the user's address book. This type of risk is called:

a) malware

b) scareware

c) virus

*d) worm

79. Unsolicited and undesired emails are called:

a) junk

*b) spam

c) DoS

d) phishing

80. An attempt to gain personal and confidential information for fraudulent purposes such as identity theft is called:

a) junk

b) spam

c) DoS

*d) phishing

81. An attempt to make a website unavailable to its users. An attacker will do this by sending a target so many communication requests that the target server eventually goes down. This describes:

a) junk

b) spam

*c) DoS

d) phishing

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82. To ensure that your password is and remains as strong as possible, you should follow all these guidelines EXCEPT:

- a) use at least eight characters
- b) include digits, punctuation, and nonprinting characters
- c) use both upper- and lowercase characters
- *d) use the same passwords on different accounts
- e) change your password regularly and don't reuse passwords or make minor variations such as incrementing a digit

83. A chalk mark on the side of the building put there by a hacker indicating an open network was available inside is called:

- *a) warchalking
- b) chalktagging
- c) chalking
- d) chalkmarking

84. Software tools that help individuals and teams keep up with their scheduled meetings, monitor projects and share work files are known as:

- *a) Groupware
- b) Microsoft Groove
- c) SharePoint
- d) Blackboard

85. A(n) ____ is a set of services for distributing private information throughout the organization using a collection of private computer networks brought together to form an organization-wide, private network.

- a) Internet
- b) extranet
- *c) intranet
- d) none of the above

86. People can use Windows, Apple, and other types of machines on the Internet as well as an intranet making it:

- a) freeware
- *b) platform independent
- c) open source
- d) none of the above

87. ____ is a communications service that allows users to communicate in real time over the Internet.

- *a) Instant messaging
- b) BlackBerry messaging
- c) Skype
- d) WebEx

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88. ____ is a method of publishing audio programs via the Internet that allows users of just about any digital audio device to download broadcasts or to subscribe to a feed of new files (usually MP3s).

*a) Podcasting

b) Blogging

c) Vlogging

d) Broadcasting

89. A ____ is a group of people who work across geographic distance.

a) dispersed team

b) localized team

c) dedicated team

*d) virtual team

90. Which of the following is NOT a benefit of using a GDT?

a) People can work from any place and at any time.

b) Organizations can recruit the best people regardless of their physical location.

*c) Travel and sometimes facilities expenses are increased.

d) There is greater flexibility for workers.

91. Which of the following statements about the Internet is true?

a) A wireless device cannot be used to connect to the Internet.

b) The Internet and the World Wide Web are interchangeable terms.

c) The Internet was discovered by Al Gore.

*d) Home users require an ISP to connect to the Internet.

e) Dial-up and broadband provide faster access to the Internet.

92. The hardware location that temporarily stores data and instruction is:

a) USB key

b) ROM

*c) RAM

d) Hard drive

93. Network traffic hardware includes all of the following EXCEPT:

a) routers

b) bridges

*c) hard drives

d) repeaters

e) hubs

94. The components of IT perform all of the following functions EXCEPT:

a) retrieving, displaying, and sending information

b) applying logic to make decisions

*c) handling customer service

d) performing mathematical calculations

e) accepting and storing information

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95. Computer networks can be classified in which of the following ways?

- *a) geographically and physically
- b) socially
- c) systematically
- d) user-friendly

96. _____ temporarily locates data and instructions before processing.

- a) Processing
- *b) Memory
- c) Input
- d) Output
- e) Storage

97. A flash memory stick is an example of:

- a) input
- b) output
- *c) storage
- d) network
- e) scanner

98. _____ stores data information and instructions for the long term.

- a) Processing
- b) Memory
- c) Input
- d) Output
- *e) Storage

99. The _____ is often referred to as the computer's "brain."

- *a) CPU
- b) LCU
- c) RAM
- d) ROM

100. Which of the following types of software controls the primary functions of a computer system?

- a) utility
- b) drivers
- c) application
- d) network
- *e) operating system

101. Which of the following is NOT considered part of a computer network?

- a) nodes
- b) software
- c) users

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d) links

*e) an electronic document

102. Network connection hardware includes all of the following components EXCEPT:

*a) phone lines

b) NIC

c) modems

d) cable modems

e) wireless cards

103. CPU stands for:

a) central packet unit

b) controller processing unit

c) controller packet unit

*d) central processing unit

e) none of the above

104. Which of the following statements about IS security is NOT true?

a) It is important to load the latest updates or patches to your antivirus software.

b) Stinger.exe is software that you can use to scan and disinfect your computer.

c) It is essential to obtain and run a firewall.

*d) The Internet has antivirus software built in making antivirus software unnecessary.

e) You should never open email attachments unless you know the sender and were expecting the email.

105. Which of the following statements about a central database system is NOT true?

a) Multiple users can access or update data quickly.

b) Users can update data from multiple and remote locations.

*c) Access to data is never limited or restricted.

d) To maintain accuracy, access to data can be limited while data are being processed.

e) Records are locked as information is updated within it.

106. In a computer, the _____ holds the instructions used to control the start-up processes.

a) CPU

b) LCU

c) RAM

*d) ROM

e) None of the above

107. A plotter is:

*a) a printer

b) a scanner

c) special architectural hardware

d) none of the above

108. In terms of IT, a protocol is:

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- a) a set of rules of how a user operates a computer
 - b) a set of courses that one uses to learn how to use a computer
 - *c) a set standard set of rules that allows communications
 - d) a set of rules that experts in the field use devices
109. The Internet uses:
- a) TCP/IP suite of packet switching protocols
 - b) number of routers connecting points throughout the world
 - c) proprietary set of rules
 - *d) A and B
 - e) B and C
110. Wi-Fi is what number of standard defined by the IEEE?
- a) 802.1
 - b) 802.1a
 - *c) 802.11
 - d) 802.11a
111. Software can be defined as:
- a) something that is controlled by the hardware
 - b) something that comes with the computer itself
 - *c) a collection of instructions that in IT device executes
 - d) games and productive programs
112. Processing, memory and storage are three components of:
- a) information technology
 - *b) basic hardware
 - c) networking components
 - d) none of the above
113. PPM stands for:
- a) people per minute
 - b) packets per minute
 - *c) pages per minute
 - d) pounds per minute
 - e) none of the above
114. PPM is used to gauge the performance of:
- *a) how fast a printer prints pages
 - b) how much network resources a printer uses
 - c) how many packets are sent through a network
 - d) how many packets a single computer sends out
 - e) none of the above
115. Modem speed is measured in:
- a) PPM

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- *b) BPS
 - c) RPM
 - d) none of the above
116. An example of a DBMS would be:
- a) Microsoft Word
 - b) Microsoft Excel
 - c) Microsoft Outlook
 - *d) Microsoft Access
 - e) None of the above
117. An example of presentation graphics software would be:
- a) Microsoft Word
 - b) Microsoft Excel
 - c) Microsoft Outlook
 - d) Microsoft Access
 - *e) None of the above
118. An example of document preparation software would be:
- *a) Microsoft Word
 - b) Microsoft Excel
 - c) Microsoft Outlook
 - d) Microsoft Access
 - e) None of the above
119. An example of electronic spreadsheet software would be:
- a) Microsoft Word
 - *b) Microsoft Excel
 - c) Microsoft Outlook
 - d) Microsoft Access
 - e) None of the above
120. A computer network consists of _____ that represent computer hardware.
- a) communications
 - *b) nodes
 - c) ports
 - d) none of the above
121. A(n) _____ provides a gateway to many other websites.
- a) search engine
 - *b) portal
 - c) ISP
 - d) affiliate
 - e) community
122. "HTTP is stateless" means that:

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- a) it does not belong to any nation state
 - b) it has no boundaries
 - *c) it forgets about requests and responses after they are complete
 - d) HTML has no state
 - e) it is international
123. The language used by web services for marking the exchanged data according to their meaning is:
- *a) XML
 - b) SOAP
 - c) WSDL
 - d) UDDI
124. The _____ you type into your browser can also be called a web address.
- a) HTTP
 - b) HTML
 - *c) URL
 - d) XML
 - e) None of the above
125. GUI stands for:
- *a) graphical user interface
 - b) graphical user internet
 - c) graded user interface
 - d) graphical unified interface
 - e) graded unified internet
126. HTTP stands for:
- a) hypertext traded protocol
 - b) hybrid transfer protocol
 - c) hypertext transfer principle
 - d) hybrid traded protocol
 - *e) none of the above
127. The Internet and the World Wide Web use which protocol to transmit messages?
- a) HTTP
 - *b) TCPIP
 - c) HTML
 - d) URL
 - e) None of the above
128. HTTP must be:
- *a) connectionless and stateless
 - b) connected and stateless
 - c) connectionless and stateful
 - d) connected and stateful

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129. A static web page file will typically hold a combination of text content and:

- a) XML commands
- b) URL commands
- *c) HTML commands
- d) HTTP commands

130. A standard set of rules for transmitting messages between the client and the server is called:

- *a) HTTP
- b) HTML
- c) XML
- d) URL

131. Which of the following is true regarding the use of passwords?

- a) They should be no more than eight characters long.
- b) They should include only lowercase letters.
- *c) They should include digits, punctuation, and nonprinting characters.
- d) They should not be changed regularly.

132. Which of the following is the process of identifying an individual and ensuring that he or she is who they claim to be?

- *a) authentication
- b) affiliate
- c) portal
- d) personalization

133. An example of a web presence as discussed in the textbook would be:

- a) an individual who has a profile on Facebook
- b) an email account
- *c) a company's website
- d) all of the above
- e) none of the above

134. Which control limits access to authorized users, thereby reducing the risk to compromised data?

- a) security
- b) encryption
- *c) passwords
- d) networks

135. Which category of the computer hierarchy includes computers that use high-speed processing chips and a large amount of memory to carry out organizational processing?

- a) embedded processors
- *b) mainframes
- c) personal computers

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- d) servers
 - e) supercomputers
136. Programmable chips that are built into products to make them “smart” are known as:
- a) collaborative software
 - *b) embedded processors
 - c) artificial intelligence
 - d) expert system
137. An important new IS infrastructure that is built with the goal of supporting web services is known as:
- a) voice over IP
 - b) active service provider network
 - *c) service-oriented architecture
 - d) public-private key encryption
 - e) social networking
138. Businesses that use only first-generation technology are limited to providing only:
- a) dynamic content
 - *b) static content
 - c) direct content
 - d) indirect content
139. A small bit of data, usually created by programs running on the server and is stored on the client machine is called a:
- a) FTP site
 - b) persistent data
 - c) browser file
 - *d) cookie
 - e) crumbs
140. Browser software interpret HTML instructions through the use of:
- *a) tags
 - b) metadata
 - c) coding
 - d) programming
 - e) none of the above

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Norrie, Huber, Piercy, McKeown
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Second Canadian Edition
TEST BANK

Chapter 3

1. According to Tom Beaman, what is some good advice for students seeking a career in IT or business?
 - *a) always be changing
 - b) grow your network of contacts
 - c) know a little about everything
 - d) be a specialist in your field
2. A broad-based formula for how a business is going to compete, what its goals should be, and what plans and policies will be needed to carry out those goals is a definition of what?
 - a) documentation
 - *b) strategy
 - c) planning
 - d) requirements
3. Which of the following is NOT one of Porter's five forces?
 - a) new entrants
 - b) suppliers
 - c) buyers
 - *d) statistics
4. The open systems model indicates that a business operates by transforming ____ into ____ and by constantly interacting with its environment.
 - *a) inputs; outputs
 - b) outputs; inputs
 - c) processes; goals
 - d) goals; processes
5. A ____ is a person or entity that has an interest in and an influence on how a business will function in order to succeed (or in order not to fail).
 - a) president or CEO
 - *b) stakeholder
 - c) shareholder
 - d) manager
6. A stakeholder may be ____ or ____ relative to the system.
 - *a) external; internal
 - b) above; below
 - c) to the right; to the left
 - d) inside; outside
7. Influence may be ____ or ____.

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- d) inside; outside
7. Influence may be ____ or ____.

- *a) actual; potential
 - b) real; imagined
 - c) right; wrong
 - d) powerful; weak
8. In functional and decentralized structures, the lines of authority (who has the right to tell whom to do what) and communication are _____ oriented.
- *a) vertically
 - b) horizontally
 - c) diagonally
 - d) none of the above
9. However, the matrix structure _____ the functional and decentralized organizational structures.
- a) opposes
 - b) aligns
 - c) contradicts
 - *d) blends
10. Which of the following is an advantage of the matrix organizational structure?
- a) frustration due to dual lines of authority and responsibility
 - *b) enhanced problem solving, cooperation, communication, and resource sharing
 - c) increased need for coordination between functional areas consumes time and resources
 - d) potential for goal conflict between functional and decentralized components of matrix
11. Which of the following is a disadvantage of the matrix organizational structure?
- a) increased flexibility and responsiveness to business needs and environmental changes
 - b) enhanced problem solving, cooperation, communication, and resource sharing
 - *c) increased need for coordination between functional areas consumes time and resources
 - d) decision making occurs lower in organization and closer to customer
12. Which of the following is a disadvantage of the functional organizational structure?
- a) economies of scale through efficient use of resources
 - b) significant technical expertise found in the functional areas
 - c) clear chain of authority and communications within a function
 - *d) employees may focus on functional area goals rather than organizational goals
13. Which of the following is an advantage of the functional organizational structure?
- *a) significant technical expertise found in the functional areas
 - b) poor communication and coordination between functional areas
 - c) relatively inflexible or slow to respond to change in the business environment
 - d) employees may focus on functional area

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14. Which of the following is an advantage of the decentralized organizational structure?
- a) duplication of resources and efforts across organizational units
 - b) technical knowledge not as in-depth relative to functional organizational form
 - *c) greater development of breadth of managerial skills

- d) less direct control by upper management
- 15. Which of the following is a disadvantage of the decentralized organizational structure?
 - *a) less direct control by upper management
 - b) faster response and greater flexibility
 - c) greater communication and coordination between organizational units
 - d) greater development of breadth of managerial skills
- 16. Organizations need to perform a series of steps known as a business:
 - a) value
 - *b) process
 - c) goal
 - d) plan
- 17. _____ to a process are those resources needed to start a process.
 - *a) Inputs
 - b) Guides
 - c) Outputs
 - d) Enablers
- 18. _____ are rules or policies within which a process must operate.
 - a) Inputs
 - *b) Guides
 - c) Outputs
 - d) Enablers
- 19. _____ are the results of a process.
 - a) Inputs
 - b) Guides
 - *c) Outputs
 - d) Enablers
- 20. _____ are a special kind of input or resource that facilitates a process.
 - a) Inputs
 - b) Guides
 - c) Outputs
 - *d) Enablers
- 21. Data, information, and knowledge are examples of _____ to a process.
 - *a) inputs
 - b) guides
 - c) outputs

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- d) enablers
- 22. _____ is a special kind of measurement created by a business process that is then returned to the system to control the system's future inputs, processes, and outputs.
 - *a) Feedback
 - b) Monitoring

- c) Reporting
 - d) None of the above
23. Which of the following is not a goal of BPR?
- a) reduce costs
 - b) increase throughput
 - c) increase speed
 - *d) increase satisfaction
24. One of the first ways that a business seeks to apply IT is through:
- a) communicating
 - b) transforming
 - *c) automating
 - d) informing
25. According to the text, which of the following is a benefit derived from automation for the banking industry?
- a) increases speed and accuracy of product transactions
 - *b) increases flexibility and improves access of services to customers
 - c) improves accuracy
 - d) reduces costs and transfers control to customers
26. According to the text, which of the following is a benefit derived from automation for the travel industry?
- a) increases speed and accuracy of product transactions
 - b) improves accuracy
 - c) reduces costs and transfers control to customers
 - *d) allows transfer of processes to customers through online services
27. According to the text, which of the following is not a benefit derived from automation for the grocery/retail industry?
- a) increases speed and accuracy of product transactions
 - b) improves accuracy
 - *c) allows transfer of processes to customers through online services
 - d) reduces costs and transfers control to customers
28. _____ is recognizing that executing processes also creates new data and information.
- a) Communicating
 - b) Automating
 - *c) Informing

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- d) Transforming
29. Using IT to help them acquire or maintain a competitive advantage over or in line with their competitors defines:
- a) communicating
 - b) automating
 - c) informing

- *d) transforming
- 30. A company possesses a _____ when it sustains higher-than-average profits for its industry.
 - a) large market share
 - b) monopoly
 - *c) competitive advantage
 - d) oligopoly
- 31. There are two basic ways of obtaining competitive advantage. What are they?
 - *a) cost and differentiation
 - b) cost and placement
 - c) differentiation and placement
 - d) none of the above
- 32. A(n) _____ is one that can be programmed; it is routine or repetitive.
 - a) unstructured decision
 - b) fully structured decision
 - *c) structured decision
 - d) semi-structured decision
- 33. Sometimes even simple decisions may have increased uncertainty, or doubt about consequences and outcomes, associated with them. This would be an example of a:
 - a) unstructured decision
 - b) fully structured decision
 - c) structured decision
 - *d) semi-structured decision
- 34. This is a novel, complex situation, with no obvious or single correct decision or decision process:
 - *a) unstructured decision
 - b) fully structured decision
 - c) structured decision
 - d) semi-structured decision
- 35. People can endlessly analyze information—a never-ending process known as:
 - a) productivity
 - b) efficiency
 - *c) analysis paralysis
 - d) effectiveness

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- 36. _____ is the ability to create business value with the least cost.
 - *a) Productivity
 - b) Efficiency
 - c) Analysis paralysis
 - d) Effectiveness
- 37. Getting the most output from a given input is known as:
 - *a) productivity

- b) efficiency
 - c) analysis paralysis
 - d) effectiveness
38. Pursuing the goal or task that is appropriate for the given situation is known as:
- a) productivity
 - b) efficiency
 - c) analysis paralysis
 - *d) effectiveness
39. _____ can be thought of as “doing the right thing, right.”
- *a) Productivity
 - b) Efficiency
 - c) Analysis paralysis
 - d) Effectiveness
40. Which of the following is not an information characteristic?
- a) complete
 - b) accurate
 - *c) readable
 - d) timely
41. A _____ exists when you find yourself in a situation that fails to meet your goals, needs, or expectations.
- a) conflict
 - b) process
 - *c) problem
 - d) situation
42. _____ refers to a series of steps or a process (logical sequence of activities) taken in response to some event or activity.
- a) Conflict resolution
 - b) Debriefing
 - *c) Problem solving
 - d) Situational review
43. Which of the following is NOT a major step in the IADD model?

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- a) investigate
 - b) analyze
 - c) decide
 - d) do
 - *e) none of the above
44. SQL stands for:
- *a) structured query language
 - b) structured query logic
 - c) simplified query language

- d) none of the above
45. _____ are the factors that you think are important and relevant to solving the problem.
- *a) Criteria
 - b) Metrics
46. This step of the IADD model is where you implement tasks and other physical activities according to your solution:
- a) investigate
 - b) analyze
 - c) decide
 - *d) do
 - e) none of the above
47. Decision makers use _____ to determine what is measured and how to measure it.
- a) criteria
 - *b) metrics
48. CSR stands for:
- a) customer service representative
 - b) customer service responsibility
 - c) corporate service representative
 - *d) corporate social responsibility
49. This implies an increasing scrutiny on businesses about the decisions they make and the rationale for them. What is it?
- *a) corporate social responsibility
 - b) green IT
 - c) ethics
 - d) protocols
50. Which of the following is a way decisions can be classified?
- a) structured, unstructured, rational, problematic
 - *b) unstructured, semistructured, structured
 - c) rational, irrational, problematic
 - d) complete, accurate, reliable, timely

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51. The third stage of the IADD problem-solving model is:
- a) deliberate
 - *b) decide
 - c) debate
 - d) defer
 - e) delegate
52. In order, from first to last, the four phases of the decision-making process are:
- a) analysis, discovery, decision, execution
 - *b) discovery, analysis, decision, execution
 - c) analysis, decision, discovery, execution

d) decision, discovery, analysis, execution

53. Problem solving refers to:

*a) a series of steps or a logical sequence of activities to respond to an event

b) a series of steps that transforms an unstructured decision to a structured decision

c) a series of steps that synthesizes several sources of information

d) a logical sequence of activities to analyze a problem

54. In the context of the IADD model, criteria are applied to evaluate each alternative's relative value and applicability in the _____ step.

a) deliberate

*b) decide

c) debate

d) do

e) delegate

55. Knowledge work activities include all of the following except:

a) discovery and transformation

*b) input and output

c) analysis and synthesis

d) communication of data

e) information and knowledge

56. Which of the following is an example of a metasearch engine?

a) Google

b) AltaVista

*c) Copernic

d) Yahoo

e) Firefox

57. Which of the following is an example of the transformation of data?

a) a database query

b) results from a web search

c) a client/customer list

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*d) sales data for the third quarter

e) creating a mailing list

58. The problem solving process consists of which of the following elements:

*a) investigate, analyze, decide, do

b) discovery, transformation, analysis, synthesis, communication

c) completeness, accuracy, reliability, relevance, objectivity, timeliness

d) decision making, problem solving, communication, technology

59. Generating alternative solutions or choices to solve a problem may mean that you may have to gather more data. This means that you will be using which of the following knowledge work activities?

a) transformation

- *b) investigation
- c) analysis
- d) synthesis
- e) discovery

60. A private version of the Internet maintained by a company is a(n):

- *a) intranet
- b) World Wide Web
- c) email
- d) LAN

61. Informing others of your information, ideas, and solutions represents which type of knowledge work?

- *a) communication
- b) discovery
- c) analysis
- d) synthesis
- e) transformation

62. According to the text, knowledge work consists of all of the following activities EXCEPT:

- a) communication
- b) discovery
- c) analysis
- d) synthesis
- *e) networking

63. Setting one's own schedule for the day represents which of the following types of decisions?

- a) semistructured
- *b) structured
- c) unstructured
- d) destructured
- e) multistructured

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64. Using the search engines available on the Internet will aid you in which step of knowledge work activity?

- a) communication
- *b) discovery
- c) analysis
- d) synthesis
- e) transformation

65. In the discovery phase, you are most likely to find:

- a) knowledge
- b) wisdom
- c) information

*d) data

66. A mandatory course that you have to take that is part of your requirements for graduation would be an example of a(n):

*a) structured decision

b) semistructured decision

c) unstructured decision

d) none of the above

e) all of the above

67. An elective course that you have to take (i.e., you must choose one liberal art course from a list would be an example of a(n):

a) structured decision

*b) semistructured decision

c) unstructured decision

d) none of the above

e) all of the above

68. A course that does not necessarily fit into the requirements for graduation (i.e., a course after you have graduated) that you decide to take is an example of a(n):

a) structured decision

b) semistructured decision

*c) unstructured decision

d) none of the above

e) all of the above

69. If you were a sidewalk vendor of frozen drinks in Saskatoon, Saskatchewan, and you only sell one frozen drink in January your effort would be considered:

a) unproductive

*b) inefficient

c) ineffective

d) none of the above

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70. If you were a sidewalk vendor of frozen drinks in Saskatoon, Saskatchewan, and you are able to produce more drinks for the amount of raw materials you have, you would be considered:

a) unproductive

b) inefficient

c) ineffective

*d) none of the above

71. The quality of the final output of this process (the decision) will likely be based on the quality of the inputs (the information and analysis you create) is the basis for this principle:

a) FIDO

*b) GIGO

c) AGO

- d) IADD
 - e) none of the above
72. The steps that one goes through in knowledge work activities can be referred to as:
- a) project flows
 - b) work product
 - c) product flows
 - *d) work flows
 - e) none of the above
73. The end result that one receives in completing knowledge work activities can be referred to as: Search engines use which technology to discover new information and pages on the Internet?
- a) project flows
 - *b) work product
 - c) product flows
 - d) work flows
 - e) none of the above
74. Search engines use which technology to discover new pages and Internet sites?
- a) bees
 - *b) spiders
 - c) packets
 - d) IP addresses
 - e) none of the above
75. In World Wide Web terms, a “hit” is:
- *a) a visit to a website
 - b) a home run
 - c) an attack on the site
 - d) a website that has been taken down
 - e) none of the above

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76. In class, we use _____ as our spreadsheet software.
- a) Microsoft Office
 - b) Corel Quattro Pro
 - c) Microsoft Access
 - *d) Microsoft Excel
 - e) None of the above
77. In class, we use _____ as our database software:
- a) Microsoft Office
 - b) Corel Quattro Pro
 - *c) Microsoft Access
 - d) Microsoft Excel
 - e) None of the above

78. If you only have seven digits of a phone number in Toronto, the information is:
- a) complete
 - *b) incomplete
 - c) inaccurate
 - d) accurate
79. If the mark you receive for this test is not correct, then it would be deemed:
- a) complete
 - b) incomplete
 - *c) inaccurate
 - d) accurate
80. If you put up your umbrella just as the rain begins to fall, your action is:
- a) reliable
 - b) unreliable
 - *c) timely
 - d) untimely
81. _____ are the factors that you think are important and relevant to solving a problem.
- a) Selections
 - b) Choices
 - *c) Criteria
 - d) Determinants
82. Which of the following is NOT part of Porter's five forces model?
- *a) globalization advantages
 - b) new entrants barriers
 - c) suppliers bargaining power
 - d) substitution barriers
 - e) buyers bargaining power

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83. The IADD model of problem solving can be used effectively in which stage of the business intelligence model?
- a) data analysis
 - b) data sourcing
 - c) situation awareness
 - d) risk assessment
 - *e) decision support

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Norrie, Huber, Piercy, McKeown
Introduction to Business Information Systems
Second Canadian Edition
TEST BANK

Chapter 4

1. The _____ is a connected series of activities, each of which adds value or supports the addition of value to the firm's goods or services.
*a) value chain
b) business process
c) logistic
d) enterprise resource management
e) supply chain
2. _____ include the receiving, warehousing, and inventory control of raw materials required to create a product or service
*a) Inbound logistics
b) Operations
c) Outbound logistics
d) Marketing and sales
e) None of the above
3. _____ are the value-creating and often proprietary activities that transform the raw inputs into the final product.
a) Inbound logistics
*b) Operations
c) Outbound logistics
d) Marketing and sales
e) None of the above
4. _____ are the activities required to get the finished product to the customer, including packaging, warehousing, and order fulfillment.
a) Inbound logistics
b) Operations
*c) Outbound logistics
d) Marketing and sales
e) None of the above
5. _____ are all activities associated with getting buyers to purchase the product, including working with distributors, retailers, or online channels.
a) Inbound logistics
b) Operations
c) Outbound logistics
*d) Marketing and sales

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e) None of the above

6. _____ are those that maintain and enhance the product's value, including customer support, repair services, and warranty and recall.

a) Inbound logistics

b) Operations

c) Outbound logistics

d) Marketing and sales

*e) None of the above

7. We normally think of _____ as those directly related to the production and distribution of the organization's products and services.

*a) primary activities

b) secondary activities

c) support activities

d) tertiary activities

8. _____ activities are value chain activities that an organization conducts to support the creation of business value by the _____ activities.

a) primary; secondary

b) secondary; support

*c) support; primary

d) secondary; primary

9. Porter identified four critical support activities. Which of the following is NOT one of them?

a) firm infrastructure

*b) production management

c) technology development

d) human resource management

10. Referred to as _____, they focus on the activities of the functional department to improve its efficiency and effectiveness.

*a) functional information systems (FIS)

b) workflow management system (WMS)

c) point-of-sale (POS)

d) transaction processing system (TPS)

11. By focusing on a business process from beginning to end, a _____ supports activities that several departments of the organization may carry out.

a) functional information systems (FIS)

*b) workflow management system (WMS)

c) point-of-sale (POS)

d) transaction processing system (TPS)

12. _____ enable transaction activities and capture the key data created by the transaction.

a) Functional information systems (FIS)

hzzled

- b) Workflow management system (WMS)
 - c) Point-of-sale (POS)
 - *d) Transaction processing system (TPS)
13. Which of the following is NOT a characteristic of a transaction?
- a) atomicity
 - b) consistency
 - *c) independence
 - d) durability
14. Which of the following characteristics is described as: “A transaction must be unequivocally completed”?
- *a) atomicity
 - b) consistency
 - c) isolation
 - d) durability
15. Which of the following characteristics is described as: “The characteristics of a completed transaction should be permanent”?
- a) atomicity
 - b) consistency
 - c) isolation
 - *d) durability
16. Which of the following characteristics is described as: “All unchanging properties of data must be preserved”?
- a) atomicity
 - *b) consistency
 - c) isolation
 - d) durability
17. Which of the following characteristics is described as: “Each transaction should execute independently of other transactions that may occur at the same time on the system”?
- a) atomicity
 - b) consistency
 - *c) isolation
 - d) durability
18. Most retail stores use a _____ to capture and store much of the data about their products.
- a) functional information systems (FIS)
 - b) workflow management system (WMS)
 - *c) point-of-sale (POS)
 - d) transaction processing system (TPS)
19. Management information systems (MIS) typically generate three types of reports. Which of the following is NOT one of them?

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- a) demand reports
 - b) periodic reports
 - *c) transaction reports
 - d) exception reports
20. A(n) _____ is designed to provide summary information about business performance to those making higher-level strategic decisions.
- *a) executive information systems (EIS)
 - b) document management systems (DMS)
 - c) enterprise resource planning (ERP)
 - d) logistics management systems (LMS)
21. A(n) _____ enters, tracks, routes, and processes the many documents used in an organization.
- a) executive information systems (EIS)
 - *b) document management systems (DMS)
 - c) enterprise resource planning (ERP)
 - d) logistics management systems (LMS)
22. _____ includes anything that can be written down, stored, and codified.
- *a) Explicit knowledge
 - b) Implicit knowledge
 - c) Tacit knowledge
 - d) Persistent knowledge
23. _____ includes the know-how that people have through learning and experience, which is difficult to write down and share.
- a) Explicit knowledge
 - b) Implicit knowledge
 - *c) Tacit knowledge
 - d) Persistent knowledge
24. To support tacit knowledge, knowledge management systems often rely on collaborative software, which supports teamwork with technologies that enable communication and sharing of data and information. This category is known as:
- a) shareware
 - b) freeware
 - *c) groupware
 - d) software
 - e) hardware
25. Conferencing tools, online bulletin boards and chat facilities, email, and meeting support applications would be an example of which type of DSS?
- *a) communications-driven
 - b) data-driven
 - c) document-driven

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- d) knowledge-driven
 - e) model-driven
26. Executive information systems (EIS), geographic information systems (GIS), and OLAP-enabled data warehouses would be an example of which type of DSS?
- a) communications-driven
 - *b) data-driven
 - c) document-driven
 - d) knowledge-driven
 - e) model-driven
27. Which type of DSS focuses on retrieval and management of unstructured documents?
- a) communications-driven
 - b) data-driven
 - *c) document-driven
 - d) knowledge-driven
 - e) model-driven
28. Expert systems (ES), artificial intelligence applications, and data mining tools would be an example of which type of DSS?
- a) communications-driven
 - b) data-driven
 - c) document-driven
 - *d) knowledge-driven
 - e) model-driven
29. Which type of DSS provides special problem-solving tools that help decision making by suggesting or recommending actions to users?
- a) communications-driven
 - b) data-driven
 - c) document-driven
 - *d) knowledge-driven
 - e) model-driven
30. A _____ is a system of organizations, people, technology, activities, information, and resources involved in moving a product or service from supplier to customer.
- a) value chain
 - b) business process
 - c) logistic
 - d) enterprise resource management system
 - *e) supply chain
31. One way to integrate the departments and functions across an organization is to use _____ software.
- a) executive information systems (EIS)

b) document management systems (DMS)

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*c) enterprise resource planning (ERP)

d) logistics management systems (LMS)

32. Which system tracks materials and other assets upon arrival into the warehouse and inventory?

a) executive information systems (EIS)

b) document management systems (DMS)

c) enterprise resource planning (ERP)

*d) logistics management systems (LMS)

33. _____ constantly monitor the supply of finished goods to ensure that enough supply is on hand to meet demand.

*a) Inventory management systems (IMS)

b) Transportation management systems (TMS)

c) Human resource information systems (HRIS)

d) Logistics management systems (LMS)

34. Which of the following is NOT an advantage of SaaS?

a) Clients no longer have to develop or maintain the applications.

b) Applications are available anywhere clients can gain access to the Web.

*c) Satisfaction of the employees and customers are increased.

d) Costs are reduced, as clients pay for only what they use and for only as long as they use the service.

35. Which of the following are examples of SaaS that are delivered by Google?

a) Gmail

b) Google Docs

c) None of the above

*d) All of the above

36. A(n) _____ is an online technology company that develops and delivers software tools on the Internet.

a) software as a service (SaaS)

*b) application service provider (ASP)

c) Internet service provider (ISP)

d) none of the above

37. When creating and implementing a business strategy, a business must attempt to identify, address, and eliminate elements of risk before they threaten its success. To do this, businesses apply

*a) enterprise risk management (ERM)

b) enterprise resource planning (ERP)

c) logistics management systems (LMS)

d) executive information systems (EIS)

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38. COSO identifies four overlapping categories of business objectives for focusing on risk assessment and management. Which of the following is NOT one of them?

- a) strategic
- b) operations
- *c) reliance
- d) compliance

39. High-level goals, aligned with and supporting its mission defines which of the COSO's categories of business objectives?

- *a) strategic
- b) operations
- c) reporting
- d) compliance

40. Effective and efficient use of its resources defines which of the COSO's categories of business objectives?

- a) strategic
- *b) operations
- c) reporting
- d) compliance

41. Reliability of reporting defines which of the COSO's categories of business objectives?

- a) strategic
- b) operations
- *c) reporting
- d) compliance

42. With respect to _____, IT can provide important data for executive decision making in setting goals and strategies that align with an organization's mission and that mitigate business risk.

- *a) strategy
- b) operations
- c) reporting
- d) compliance

43. We have seen many ways in which IT supports _____ by automating, informing, and transforming, and through the implementation of enterprise systems

- a) strategy
- *b) operations
- c) reporting
- d) compliance

44. With the appropriate IT systems in place, on-demand _____ provides organizations with critical information that they need to manage their business.

- a) strategy
- b) operations

hzzled

*c) reporting

d) compliance

45. _____ reduces risk through policies and processes that ensure proper financial and accounting procedures.

a) Strategy

b) Operations

c) Reporting

*d) Compliance

46. Which type of organizational response to risk is described by: “Move the risk to someone who is more able to deal with it”?

*a) risk transfer

b) risk deferral

c) risk reduction

d) risk acceptance

e) risk avoidance

47. Which type of organizational response to risk is described by: “Postpone exposure to the risk until circumstances are more favourable or resources are available to address the risk”?

a) risk transfer

*b) risk deferral

c) risk reduction

d) risk acceptance

e) risk avoidance

48. Which type of organizational response to risk is described by: “Either minimize the probability of the risk occurring or lessen the impact”?

a) risk transfer

b) risk deferral

*c) risk reduction

d) risk acceptance

e) risk avoidance

49. Which type of organizational response to risk is described by: “Realize that some risks are unavoidable and make sure that contingency plans are in place”?

a) risk transfer

b) risk deferral

c) risk reduction

*d) risk acceptance

e) risk avoidance

50. Which type of organizational response to risk is described by: “Eliminate the possibility of the risk occurring; however, that may close the doors on some business opportunities as well”?

a) risk transfer

b) risk deferral

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- c) risk reduction
- d) risk acceptance
- *e) risk avoidance

51. Organizations used for outsourcing are often held to strict _____, which penalize the organization monetarily should it not be met.

- *a) service level agreements (SLA)
- b) disaster recovery plans (DRP)
- c) business continuity plans (BCP)
- d) none of the above

52. A _____ allows an organization to resume operations after a major event that interrupts normal business processes.

- a) service level agreement (SLA)
- *b) disaster recovery plan (DRP)
- c) business continuity plan (BCP)
- d) none of the above

53. A _____ addresses problem prevention, response to crises, resumption of business, recovery of losses, and restoration of systems and processes.

- a) service level agreement (SLA)
- b) disaster recovery plan (DRP)
- *c) business continuity plan (BCP)
- d) none of the above

54. A _____ essentially involves being able to reverse every action that took place to make the change happen such that everything is returned to its original state with no damage done.

- *a) roll-back strategy
- b) contingency
- c) simulation
- d) prototype

55. Another name for a backup plan is:

- a) roll-back strategy
- *b) contingency
- c) simulation
- d) prototype

56. Roll-back strategies and contingency planning are both part of the _____ category of organizational response to risk.

- a) risk transfer
- b) risk deferral
- c) risk reduction
- *d) risk acceptance
- e) risk avoidance

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57. Businesses generally base control around three key concepts. Which of the following is NOT one of them?
- a) Control is a process that runs throughout the organization.
 - b) Control influences how people behave at work.
 - *c) Control can provide absolute assurance of achieving objectives.
 - d) None of the above
58. _____ prevent, detect, and correct actions that increase the enterprise's risk of failing to meet business objectives.
- *a) Effective controls
 - b) Internal controls
 - c) Efficient controls
 - d) Preventive controls
59. A process affected by an entity's board of directors, management, and other personnel, designed to provide reasonable assurance regarding the achievement of objectives defines which type of control?
- a) effective controls
 - *b) internal controls
 - c) efficient controls
 - d) preventive controls
60. _____ are designed to avoid increased exposure to risk by stopping some action or process before it occurs.
- a) Effective controls
 - b) Internal controls
 - c) Efficient controls
 - *d) Preventive controls
61. When an employee has not changed his or her password in 25 days, the employee may get a warning email message asking him or her to do so immediately. This is an example of what type of control?
- a) corrective controls
 - b) internal controls
 - *c) detective controls
 - d) preventive controls
62. _____ aim to remedy the situation and try to keep it from recurring.
- *a) Corrective controls
 - b) Internal controls
 - c) Detective controls
 - d) Preventive controls
63. Which of the following is NOT one of the seven generic categories of controls?
- *a) aggregation of duties
 - b) authorization

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- c) security
 - d) verification
64. Which of the following is NOT one of the seven generic categories of controls?
- a) ID codes
 - *b) sanitization
 - c) control totals
 - d) supervisory review
65. _____ means that jobs do not span lines of control that would allow mistakes or fraud to go undetected.
- *a) Segregation of duties
 - b) Authorization
 - c) Security
 - d) Verification
66. _____ controls prevent scope creep and cost overruns in various situations, such as major projects or operations management.
- a) Segregation of duties
 - *b) Authorization
 - c) Security
 - d) Verification
67. Your student number is an example of which type of control?
- *a) ID codes
 - b) sanitization
 - c) control totals
 - d) supervisory review
68. _____ can confirm that the application is accomplishing e-commerce functions (e.g., order placement, payment) without error.
- a) Segregation of duties
 - b) Authorization
 - c) Security
 - *d) Verification
69. Functions, while necessary, do not add value to the activity or organization are known as:
- *a) non-value-added
 - b) nil-value-added
 - c) zero-value-added
 - d) none of the above
70. Organizational stakeholders may be:
- a) internal personnel
 - b) government agencies
 - c) customers or clients

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*d) all of the above

71. Influence of stakeholders may be:

- a) perceived
- b) actual
- c) potential
- d) A and B
- *e) B and C

72. Businesses must remain _____ to their environment.

- a) closed
- b) adaptive
- *c) open
- d) rigid
- e) none of the above

73. An open boundary allows a business to receive _____ and produce _____.

- a) money; products
- b) products; money
- c) outputs; inputs
- *d) inputs; outputs

74. A _____ attack bombards a website with thousands of requests for pages

- a) DNS
- *b) DoS
- c) DNA
- d) DOD
- e) none of the above

75. To transform inputs to their main outputs, organizations need to perform:

- a) transforming
- b) informing
- *c) business process
- d) none of the above

76. In _____ and _____ structures, the lines of authority are vertically oriented.

- a) matrix; centralized
- b) matrix; decentralized
- c) functional; centralized
- *d) functional; decentralized

77. One input to an open system organization is capital. Capital is:

- a) people hired to carry out all or part of the business processes
- *b) the money that businesses need to operate
- c) the “ingredients” from which the company makes its products

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d) raw facts, summarized data, and information derived from research

78. The _____ is a connected series of activities, each of which adds value or supports the addition of value to the firm's goods or services.

*a) value chain

b) value added service

c) chain of service

d) none of the above

79. _____ include the receiving, warehousing and inventory control of raw material required to create a product or service.

a) Receiving departments

b) Shipping departments

c) Outbound logistics

*d) Inbound logistics

e) Operations

80. _____ are the value-creating and often proprietary activities that transform the raw inputs to the final product.

a) Value chain

b) Value added

c) Outbound logistics

d) Inbound logistics

*e) Operations

81. _____ are the activities required to get the finished product to the customer, including packaging, warehousing, and order fulfillment.

a) Receiving departments

b) Shipping departments

*c) Outbound logistics

d) Inbound logistics

e) Operations

82. Withdrawing money at an ATM machine is an example of:

*a) a transaction

b) a sale

c) a debit

d) none of the above

83. A _____ activity is one that is directly related to the production and distribution of the organization's products and services.

*a) primary

b) secondary

c) tertiary

d) support

e) none of the above

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84. _____ activities are value chain activities that an organization conducts to support the creation of business value by the _____ activities.
- a) primary; support
 - b) secondary; support
 - *c) support; primary
 - d) support; secondary
85. All of the following are considered support activities EXCEPT:
- *a) shipping and receiving
 - b) administration
 - c) technology development
 - d) human resource management
 - e) procurement
86. An organization's value chain is the _____ of its primary and support activities.
- a) difference
 - *b) sum
 - c) multiplication
 - d) division
 - e) none of the above
87. Which of the following is an example of a service activity?
- a) obtaining raw materials
 - b) making the product
 - *c) billing the client
 - d) shipping the product
88. The following type of IS was designed to support activities throughout an organization's value chain:
- a) logistics management system
 - b) transaction processing system
 - c) customer relationship management system
 - *d) enterprise resource planning system
89. Recognizing that executing processes also creates new data and information is called:
- a) transforming
 - b) automating
 - *c) informing
 - d) decimating
90. Employing bar codes on items to register a sale is an example of:
- *a) automating
 - b) informing
 - c) support of value chain
 - d) business processes

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91. Which of the two IT applications listed focus on processes and applications?
- *a) automating and informing
 - b) informing and support of value chain
 - c) automating and transforming for competitive advantage
 - d) support of value chain and transforming for competitive advantage
92. Which IT application below has the most impact on gaining a competitive advantage?
- a) automating
 - b) informing
 - c) support of value chain
 - d) people
 - *e) transforming
93. When applying IT, a business must consider all of the following factors EXCEPT:
- a) interaction of technology with people
 - b) organizational structure
 - *c) organizational resources
 - d) business processes
 - e) organizational culture and environment
94. Which of the following applications would be helpful in the automating process?
- a) using survey data to target advertising
 - *b) using online ordering forms
 - c) collecting data from online ordering forms
 - d) creating a unique approach to reach customers, such as Amazon's "one-click" ordering system
95. Which of the following applications would be helpful in the informing process?
- a) using survey data to target advertising
 - b) using online ordering forms
 - *c) collecting data from online ordering forms
 - d) creating a unique approach to reach customers, such as Amazon's "one-click" ordering system
96. Which of the following applications would be helpful in gaining a competitive advantage?
- a) using survey data to target advertising
 - b) using online ordering forms
 - c) collecting data from online ordering forms
 - *d) creating a unique approach to reach customers, such as Amazon's "one-click" ordering system
97. A stakeholder in a business can be all of the following EXCEPT:
- a) customer
 - b) government agency
 - c) competitor

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d) employee

*e) journalist

98. The ingredients from which a company makes its products describe which input in an opensystem organization?

a) labour

*b) raw materials

c) capital

d) technology

e) data, information, and knowledge

99. Money, bonds, and stock describe which input in an open-system organization?

a) labour

b) raw materials

*c) capital

d) technology

e) data, information, and knowledge

100. Which one of the following is not an input to the organization as an open system?

a) technology

b) information

c) raw materials

d) labour

*e) feedback

101. Which one of the following is an output in an open system organization?

a) technology

b) capital

c) raw materials

d) labour

*e) feedback

102. Which stakeholder listed below is not an organizational decision maker?

*a) customer

b) employee

c) shareholders

d) board of directors

e) management

103. The support components of the value chain include all of the following functions EXCEPT:

*a) distribution

b) procurement

c) human resources

d) technology

e) administration

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104. When beginning to automate a process, all of the following questions are critical EXCEPT:

- a) What is the goal?
- b) What are the steps?
- c) What data and information are needed to carry out the steps?
- d) How is the new process affected by other processes in the organization?
- *e) What is the cost of the new process?

105. In the Ryerson University environment, which of the following would not be considered stakeholders?

- a) students
- b) professors
- c) government
- d) staff
- *e) none of the above

106. If there are barriers to entry, then it will be _____ for new competitors to gain entry.

- *a) harder
- b) easier
- c) impossible
- d) illegal
- e) none of the above

107. Which type of control is designed to prevent increased exposure to risk by stopping some action or process before it occurs?

- a) corrective controls
- b) internal controls
- *c) preventive controls
- d) detective controls

108. Which type of control aims to remedy the situation and try to keep it from recurring?

- *a) corrective controls
- b) internal controls
- c) preventive controls
- d) detective controls

109. Businesses apply the COSO framework of enterprise risk management in all of the following ways except:

- a) identify and categorize potential risks
- *b) impact and certainty
- c) assess risks and threats
- d) determine likelihood of a DoS attack
- e) decide if risk is acceptable

110. A business generally bases its IT and IS control on all of the following concepts EXCEPT:

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- *a) Control is a process that is handled only in the IT Department.
 - b) Control influences how people behave at work.
 - c) Control can provide only reasonable, not absolute, assurance of achieving objectives.
 - d) Control is a process that runs throughout the organization.
 - e) Control ensures safety of data and information.
111. Supervisory review in the internal control process ensures that which of the following reviews have been accomplished?
- *a) transaction review process
 - b) ID codes
 - c) verification
 - d) segregation of duties
 - e) authorization
112. The Information Technology Infrastructure Library (ITIL):
- *a) is a set of best-practices standards for IT and service management
 - b) is a U.S. Central Computer and Telecommunications Agency creation
 - c) guides process improvements associated with software development
 - d) defines effectiveness and efficiency of operations
113. Which type of control aims to stop the situation from ever happening?
- a) corrective controls
 - b) internal controls
 - *c) preventive controls
 - d) detective controls
114. Which control can help detect fraudulent actions?
- a) internal control
 - b) segregation of duties
 - c) ID codes
 - *d) control totals
 - e) none of the above
115. A model-driven DSS:
- *a) emphasizes access to and manipulation of a model
 - b) focuses on retrieval and management of unstructured documents
 - c) emphasizes access and manipulation of internal company data and sometimes external data
 - d) provides special problem-solving tools
 - e) focuses on communications and shared decision making
116. A model that uses statistics and probability to describe or to forecast possible scenarios is known as a(n):
- a) financial model
 - b) simulation model
 - *c) statistical model
 - d) optimization model

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117. DRP stands for:

- a) data recovery position
- *b) disaster recovery planning
- c) digital recovery planning
- d) data recovery planning

118. A DRP is needed to resume operations after a major event such as:

- a) network upgrades
- b) data recovery
- *c) natural disasters
- d) A and B
- e) A and C

119. Annual financial statements or monthly sales reports are an example of:

- *a) periodic reports
- b) exception reports
- c) demand reports
- d) none of the above

120. Which type of report monitors when and why odd things happen in reporting that is critical to the operation?

- a) periodic reports
- *b) exception reports
- c) demand reports
- d) none of the above

121. Reports generated based on user requests are which type of reports?

- a) periodic reports
- b) exception reports
- *c) demand reports
- d) none of the above

122. Which of the following is not one of the five types of decision support systems?

- *a) people-driven
- b) communication-driven
- c) data-driven
- d) document-driven
- e) knowledge-driven

123. A model for conducting experiments that test possible outcomes resulting from a quantitative model of a system is known as:

- a) financial model
- *b) simulation model
- c) statistical model
- d) optimization model

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124. All of the following are challenges to businesses using sourcing EXCEPT:

- a) increased or hidden costs
- b) ethical concerns
- *c) flexibility and profitability
- d) reduced and/or timely services
- e) loss of company knowledge

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Introduction to Business Information Systems
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Chapter 5

1. According to Sherril Burns what is good on-the-job advice?

- *a) The better way is to do things differently.
- b) The better way is to things the same.
- c) The better way to do things is with others.
- d) The better way to do things is alone.

2. _____ is the use of information systems, technologies, and computer networks by individuals and organizations to carry out transactions in order to create or support the creation of business value.

- *a) E-commerce
- b) M-commerce
- c) E-business
- d) M-business

3. Online equivalent of the retail store as well as other services describes which type of ecommerce transaction?

- *a) business-to-consumer (B2C)
- b) business-to-business (B2B)
- c) business-to-government (B2G)
- d) consumer-to-government (C2G)
- e) consumer-to-consumer (C2C)

4. Electronic exchanges between companies for the Worldwide Retail Exchange describes

which type of e-commerce transaction?

- a) business-to-consumer (B2C)
- *b) business-to-business (B2B)
- c) business-to-government (B2G)
- d) consumer-to-government (C2G)
- e) consumer-to-consumer (C2C)

5. Online sales to government agencies, as well as electronic payment of taxes, describes which type of e-commerce transaction?

- a) business-to-consumer (B2C)
- b) business-to-business (B2B)
- *c) business-to-government (B2G)
- d) consumer-to-government (C2G)
- e) consumer-to-consumer (C2C)

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6. Electronic payment of taxes as well as purchase of various types of licences describes which type of e-commerce transaction?

- a) business-to-consumer (B2C)
- b) business-to-business (B2B)
- c) business-to-government (B2G)
- *d) consumer-to-government (C2G)
- e) consumer-to-consumer (C2C)

7. Use of online auctions like eBay and similar other sites describes which type of e-commerce transaction?

- a) business-to-consumer (B2C)
- b) business-to-business (B2B)
- c) business-to-government (B2G)
- d) consumer-to-government (C2G)
- *e) consumer-to-consumer (C2C)

8. We can divide such products into two primary categories. What are they?

- a) static and physical
- b) digital and analog
- c) dynamic and static
- d) digital and dynamic
- *e) physical and digital

9. Selling upgrades to a premium subscription service by first offering a free service with more limited capacity or capability demonstrates the:

- a) premium model
- b) free-to-buy model
- *c) freemium model
- d) rent-to-own model

10. The ability of the consumer to move from thought to action creates new opportunities for

businesses to operate at lower costs by easing the burden of the supply chain electronically.

This is referred to as:

- a) seamless transactions
- b) information density
- c) cost per click (CPC)
- *d) frictionless transactions
- e) none of the above

11. The quality and quantity of information about products and services of interest to buyers has increased. This defines:

- *a) information density
- b) personalization
- c) niche markets
- d) perfect markets

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12. A marketing message that a business customizes for each potential customer's interests, based on his or her searching, browsing, and buying habits is known as:

- a) information density
- *b) personalization
- c) niche markets
- d) perfect markets

13. Which of the following is a benefit to the business in B2C e-commerce?

- a) lower prices
- b) shopping 24/7
- c) greater searchability of products worldwide
- d) shorter delivery times for digital products
- *e) cheaper electronic transactions
- f) improved customer service

14. Which of the following is a limitation to the customer in B2C e-commerce?

- a) increased competition due to global marketplace
- *b) unavailability of micropayments for purchases of small-cost products
- c) ease of comparison between competing products drives prices down
- d) customers want specific choices and will not accept substitutes
- e) customers control flow of information instead of companies

15. A _____ key encryption uses the same private key to encrypt and decrypt a message.

- a) public
- b) combo
- c) primary
- *d) private

16. A _____ key encryption system has two keys required to successfully read a message.

- *a) public
- b) combo

- c) primary
 - d) private
17. A _____ transaction is when you buy something at market price determined by supply and demand from someone you do not know.
- a) strategic sourcing
 - *b) spot buying
 - c) impulse buying
 - d) outsourcing
 - e) none of the above
18. _____ involves forming a long-term relationship with another company.
- *a) Strategic sourcing
 - b) Spot buying
 - c) Impulse buying

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- d) Outsourcing
 - e) None of the above
19. With the one-to-many model, the seller often provides a web-based private sales channel through a private network, called:
- a) enterprise resource management (ERP)
 - b) customer resource management (CRM)
 - *c) electronic data interchange (EDI)
 - d) customer service management (CSM)
20. Another name for an electronic data interchange (EDI) is:
- a) Internet
 - b) intranet
 - *c) extranet
 - d) none of the above
21. When there is an auction when the bidder with the lowest bid wins, it is called a:
- *a) reverse auction
 - b) low auction
 - c) backwards auction
 - d) sellers auction
22. In the _____, many companies use an exchange to buy and sell from each other through spot-buying transactions.
- a) vertical exchange
 - b) diagonal exchange
 - c) horizontal exchange
 - *d) exchange model
23. Exchanges that meet the needs of a single industry are called a(n):
- *a) vertical exchange
 - b) diagonal exchange

- c) horizontal exchange
 - d) exchange model
24. Exchanges that deal with products and services that all companies need, regardless of the industry are called a(n):
- a) vertical exchange
 - b) diagonal exchange
 - *c) horizontal exchange
 - d) exchange model
25. The traditional procurement process has three key elements. Which of the following is NOT one of them?
- a) the purchase order
 - b) the invoice

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- *c) the delivery of goods
 - d) the receipt of goods
26. Step 1 of a traditional procurement process is when the buyer sends a(n) _____ to a vendor.
- *a) purchase order (PO)
 - b) bill of lading (BOL)
 - c) invoice
 - d) receipt of goods
27. Step 2 of a traditional procurement process is when the vendor responds by sending the goods to the buyer along with a(n) _____, which describes the contents of the shipment.
- a) purchase order (PO)
 - *b) bill of lading (BOL)
 - c) invoice
 - d) receipt of goods
28. Step 3 of a traditional procurement process is when the buyer sends back a signed copy to the vendor and internally files a(n) _____.
- a) purchase order (PO)
 - b) bill of lading (BOL)
 - c) invoice
 - *d) receipt of goods
29. Step 4 of a traditional procurement process is when the vendor sends a(n) _____ to the buyer.
- a) purchase order (PO)
 - b) bill of lading (BOL)
 - *c) invoice
 - d) receipt of goods
30. A(n) _____ is a detailed list of goods shipped from the supplier, along with a list of all costs and discounts. In essence, it is a detailed bill and request for payment.
- a) purchase order (PO)

- b) bill of lading (BOL)
 - *c) invoice
 - d) receipt of goods
31. A(n) _____ is “a networked information system used by two or more separate organizations to perform a joint business function.”
- a) operating system (OS)
 - *b) interorganizational system (IOS)
 - c) intranet
 - d) extranet
 - e) electronic data interchange (EDI)
32. The two most common forms of IOS are:

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- a) extranet and intranet
 - b) extranet and internet
 - c) EDI and intranet
 - *d) EDI and extranet
 - e) EDI and Internet
33. _____ uses value-added networks (VANs) or private networks instead of the regular telephone system.
- a) Operating system (OS)
 - b) Interorganizational system (IOS)
 - c) Intranet
 - d) Extranet
 - *e) Electronic data interchange (EDI)
34. Collaborative networks that use Internet technology to link businesses with their suppliers, customers, or other businesses that share common goals is/are called:
- a) operating system (OS)
 - b) interorganizational system (IOS)
 - c) intranet
 - *d) extranet
 - e) electronic data interchange (EDI)
35. Which of the following is not an e-commerce benefit for businesses?
- a) expansion of marketplace to global proportions
 - *b) more expensive electronic transactions
 - c) greater customer loyalty through customized web pages and 1-to-1 marketing
 - d) expansion of niche marketing opportunities
36. A business _____ defines how a company will meet the needs of its customers while making a profit.
- a) operation
 - *b) model
 - c) division

d) centre

37. A(n) _____ website facilitates sales between third parties.

a) advertising

b) affiliate

*c) brokerage

d) marketing

38. A protected network designed to conduct business between two or more trading partners is called:

a) intranet

b) Internet

*c) extranet

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d) e-commerce

e) local area network

39. B2B transactions can be divided into two types, namely _____ and _____.

*a) spot buying; strategic sourcing

b) outsourcing; EDI

c) e-commerce; outsourcing

d) strategic sourcing; e-commerce

e) spot buying; e-commerce

40. _____ is an e-commerce business model where websites are paid a fee when purchases come through them.

a) Brokerage

b) Advertising

*c) Affiliate

d) Subscription

e) Intermediary

41. All organizations must have a(n):

a) strategic model

b) planning model

c) analytic model

*d) business model

42. The Internet also brought along the forces of _____ as a way for manufacturers such as Dell and others, to directly solicit orders from consumers and deliver products directly, rather than relying on a global network of wholesalers and distributors/dealers as a way of bringing products to the market.

a) customization

b) personalization

*c) build to order

d) individualized

43. Who said “Strategy is a plan, pattern, position and perspective”?

- a) Michael Porter
- b) Sir Francis Bacon
- c) Steve Jobs
- d) Bill Gates
- *e) Henry Mintzberg

44. Buying a new pair of jeans at www.thegap.com is an example of which kind of e-commerce transaction:

- a) B2B (business-to-business)
- b) C2C (consumer-to-consumer)
- *c) B2C (business-to-consumer)
- d) B2G (business-to-government)

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45. Sellers use e-commerce to customize their products and services in which of the following two ways:

- *a) mass customization and personalization
- b) marketpace and personalization
- c) personalization and customer relationship management (CRM)
- d) customer relationship management (CRM) and mass customization

46. E-commerce affects competition between organizations in all of the following ways EXCEPT:

- a) preventing any company from “owning” the market
- b) enhancing collaboration/alliances
- c) multiplying market niches
- *d) increasing barriers to entry

47. An important strategy that companies are using to create a one-to-one marketing experience for their customers is known as:

- a) co-operative website
- *b) CRM
- c) interorganizational system
- d) division

48. The use of laptops, mobile telephones, and personal digital assistants (PDAs) to connect to the Internet and web to conduct many of the activities normally associated with e-commerce is known as:

- *a) mobile Commerce (m-commerce)
- b) extranet
- c) digital Commerce (d-commerce)
- d) intranet

49. All of the following are an example of a physical good EXCEPT:

- a) DVD
- *b) iTunes Song
- c) comic book

d) MP3 player

50. Which of the following is an example of an e-commerce business model?

a) brokerage

b) advertising

c) merchant

*d) all of the above

e) none of the above

51. Which of the following business models allows two companies to collaborate to create a trading relationship that is mutually beneficial?

a) company-centric business model

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*b) one-to-one business model

c) exchange model

d) chain efficiency

52. The traditional procurement process relies on:

*a) all paper-based documents

b) all electronic-based documents

c) some paper-based and some electronic-based documents

d) none of the above

53. Building a meaningful e-commerce strategy requires two different views of an organization's strategy: what it wants to do the _____ strategy and _____ strategy that focuses on how it will do it.

*a) conceptual; technology

b) technology; conceptual

c) conceptual; risk analysis

d) risk analysis; promotion

54. Which of the following is NOT a type of e-commerce transaction?

a) B2C

b) B2B

c) C2C

d) B2G

*e) G2P

55. _____ is a type of e-commerce business model that brings together buyers and sellers for a fee.

*a) Brokerage

b) Advertising

c) Affiliate

d) Subscription

e) Infomediary

56. _____ is a type of transaction using hand-held devices such as cell phones and PDAs.

- a) H-commerce
- b) E-commerce
- *c) M-commerce
- d) G-commerce
- e) C-commerce

57. _____ is a type of private network established between two or more business partners for electronic data exchange.

- a) LAN
- b) WAN
- c) MAN

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*d) VAN

58. _____ products include anything that actually requires an actual shipment of the item.

- a) Virtual
- b) Digital
- *c) Physical
- d) All of the above
- e) None of the above

59. A company-centric business model uses which of the following e-commerce model(s) to conduct business?

- a) one-to-many
- b) many-to-one
- c) many-to-many
- d) many-to-any
- *e) both A and B

60. The advertisements that you see on the side bars of many web pages are referred to as:

- a) ad bars
- b) ad wars
- *c) ad words
- d) adverts
- e) none of the above

61. The quality and quantity of information about products and services of interest to them refers to:

- a) information intensity
- b) information denial
- *c) information density
- d) information overload

62. The ability to create custom product or services on-demand is referred to as:

- a) mass personalization
- *b) mass customization
- c) individuality

d) uniqueness

63. A marketing message that a business customizes for each potential customer's interest, refers to:

a) uniqueness

b) mass customization

c) individuality

*d) personalization

64. "A broad-based formula for how a business is going to compete, what its goals should be and what plans and policies will be needed to carry out those goals" defines:

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a) marketing

*b) strategy

c) advertising

d) business intelligence

e) none of the above

65. According to Porter's model, e-commerce _____ competition.

*a) increases

b) decreases

c) eliminates

d) improves

e) none of the above

66. When discussing benefits and limitations of B2C e-commerce, expansion of niche marketing opportunity falls in which area?

a) consumer benefits

b) consumer limitations

*c) business benefits

d) business limitations

67. When discussing benefits and limitations of B2C e-commerce, increased competition due to global marketplace falls in which area?

a) consumer benefits

b) consumer limitations

c) business benefits

*d) business limitations

68. Which business model involves forming a long term relationship with another company?

*a) strategic sourcing

b) B2B

c) brokerage

d) co-operative website

e) none of the above

69. If you have multiple vendors that provide you with products or services in a particular area, you would have which relationship?

- a) one to many
- *b) many to one
- c) many to many
- d) one to one

70. E-commerce has added value to an organization in all of the following ways EXCEPT:

- a) customer loyalty
- *b) increased need for technology
- c) increased revenue
- d) profitability.

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71. Which control can confirm that the application is accomplishing e-commerce functions?

- a) authorization
- b) security
- *c) verification
- d) supervisory review
- e) none of the above

72. A _____ exchange meets the needs of a single industry. A _____ exchange deals with products and services that all companies need, regardless of the industry.

- a) parallel; straight
- b) horizontal; vertical
- c) straight; parallel
- *d) vertical; horizontal

73. Going to another seller means that a company will have to retrain their staff to use a new application. This type of cost would be an example of:

- a) training costs
- b) educational costs
- c) employee costs
- *d) switching costs
- e) none of the above

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Chapter 6

1. _____ is/are raw unorganized facts, numbers, pictures, and so on.

- *a) Data
- b) Information
- c) Knowledge
- d) Wisdom

2. _____ is/are organized and is/are useful to a person.

- a) Data
- *b) Information
- c) Knowledge
- d) Wisdom

3. _____ is/are created when a person combines experience and judgement.

- a) Data
- b) Information
- *c) Knowledge
- d) Wisdom

4. Names of clients, their phone numbers, and their email addresses in an address book program in a personal digital assistant would be an example of:

- a) data
- *b) information
- c) knowledge
- d) wisdom

5. _____ adds insight and ethics to the experience and professional judgement.

- a) Data
- b) Information
- c) Knowledge
- *d) Wisdom

6. Breaking down the whole into its more discrete parts to better understand how it works describes:

- a) discovery
- *b) analysis
- c) transformation
- d) synthesis
- e) communication

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7. _____ is knowledge work that requires you to use the results to deepen your understanding of the data and information.

- a) Discovery
- b) Analysis
- *c) Transformation
- d) Synthesis

e) Communication

8. _____ allows you to interpret trends or patterns that seem to explain the past and the present, and may suggest courses of action likely to favourably influence the future.

a) Discovery

b) Analysis

c) Transformation

*d) Synthesis

e) Communication

9. An anomaly is:

a) a typical case

*b) an exceptional case

c) an average case

d) an only case

10. The ability to share your analyses, ideas, and solutions with others refers to:

a) discovery

b) analysis

c) transformation

d) synthesis

*e) communication

11. A data _____ consists of interrelated data that are stored in files and organized so that computer programs can quickly and easily access specific pieces of data.

a) warehouse

b) centre

*c) base

d) hierarchy

e) none of the above

12. A specific combination of bits represents each data:

*a) character

b) bit

c) byte

d) field

13. The ASCII encoding scheme will use:

a) 8 bytes

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*b) 8 bits

c) 16 bits

d) 16 bytes

14. Unicode will store the “a” letter using:

a) 8 bytes

b) 8 bits

*c) 16 bits

- d) 16 bytes
15. A combination of characters representing a data item is known as a:
- a) table
 - *b) field
 - c) entry
 - d) record
 - e) database
16. A collection of fields is known as a:
- a) table
 - b) entry
 - c) category
 - *d) record
 - e) database
17. A collection of records is known as a:
- *a) table
 - b) entry
 - c) category
 - d) field
 - e) database
18. The top level of the data hierarchy compiles the organized collection of files into a:
- a) table
 - b) entry
 - c) category
 - d) field
 - *e) database
19. The unique identifier of a record in a database is called a _____ key.
- a) public
 - b) private
 - *c) primary
 - d) foreign
20. A key that is borrowed from another table to create another table is called a _____ key.
- a) public

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- b) private
 - c) primary
 - *d) foreign
21. The primary method for accessing and using data in an RDBMS is a:
- a) inquiry
 - *b) query
 - c) investigation
 - d) analysis

22. A _____ is a tool for asking a question of a database.
- a) table
 - b) record
 - c) field
 - *d) query
23. There are two commonly used models for designing the organization of a relational database. Which of the following is one of them?
- a) RDBMS
 - b) DBMS
 - c) ERP
 - *d) ERD
 - e) DFD
24. Which of the following is not a component of a traditional DFD?
- a) the external entities that send input or receive output from the system
 - b) processes that show activities that move or transform data
 - c) data stores that usually correspond to tables in the data model
 - d) data flows that connect the components
 - *e) none of the above
25. A _____ is a means of storing and managing data for information access, typically composed of data from one or more transaction databases.
- a) data mart
 - b) data model
 - *c) data warehouse
 - d) data mine
26. A _____ extracts and reorganizes subject-area-specific data to allow business professionals to focus on a specific subject area.
- a) data model
 - b) data warehouse
 - c) data mine
 - *d) data mart

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27. Database technology is _____ compared to data warehouse technology when discussing response time.
- a) much slower
 - b) a little slower
 - c) about the same
 - d) a little faster
 - *e) much faster
28. _____ is a process for gaining competitive advantage through the intelligent use of data and information in decision making.
- a) Business process re-engineering

- b) Decision support
 - *c) Business intelligence
 - d) Analysis
29. Which of the following is not a stage of business intelligence?
- a) data sourcing
 - b) data analysis
 - c) situation awareness
 - *d) risk avoidance
30. Identifying decision options and evaluating them based on expectations of risk and reward describes which stage of business intelligence?
- a) data sourcing
 - b) data analysis
 - *c) risk assessment
 - d) decision support
31. There are multiple ways of organizing knowledge management systems. Which of the following is NOT one of them?
- a) balanced scorecard
 - b) dashboard
 - c) measurement matrix
 - *d) query
32. Decision making can occur at many levels. Which is the most fundamental and lowest level?
- a) technical
 - b) operational
 - c) strategic
 - *d) none of the above
33. Decision making can occur at many levels. Which is at the highest level?
- a) tactical
 - b) operational
 - *c) strategic

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- d) none of the above
34. Who is quoted as saying “Knowledge is power”?
- a) Sir Alec Guinness
 - b) Sir John A. Macdonald
 - *c) Sir Francis Bacon
 - d) Sir Anthony Hopkins
35. In which method do databases store information about entities?
- a) entity relationship diagram
 - b) Porter’s five forces model
 - c) data entity method

- *d) relational data model
 - e) none of the above
36. Tables consist of _____ represented by the rows of the table.
- *a) records
 - b) items
 - c) entities
 - d) fields
37. Which of the following is not an advantage of a database system?
- a) data independence
 - *b) increases data redundancy
 - c) maintains quality of data
 - d) handles security, synchronizes access by users
 - e) allows for improved data access, different views of data, and report generation
38. The primary technology used to store, manage, and allow efficient access to data is the:
- *a) database
 - b) data warehouse
 - c) data farm
 - d) cloud computing
 - e) computer network
39. A database consists of:
- a) unrelated data
 - *b) interrelated data
 - c) correlated data
 - d) A and B
 - e) B and C
40. DBMS stands for:
- a) double base management system
 - b) dual base management system
 - *c) data base management system

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- d) none of the above
41. The data hierarchy:
- a) determines which type of data has precedent over another type
 - b) determines which type of data is faster than others
 - *c) organizes stored data in increasing levels of complexity
 - d) none of the above
42. A specific combination of bits represents each data:
- a) mine
 - *b) character
 - c) warehouse
 - d) base

e) none of the above

43. "Because files are designed for specific applications, their format may not be usable by other applications that need the data" would define:

a) data redundancy

*b) data dependence

c) data inaccessibility

d) none of the above

44. "Data can be difficult to access in ways other than those allowed by the related application," defines:

a) data redundancy

b) data dependence

*c) data inaccessibility

d) none of the above

45. "It is difficult to manage the files for use by multiple users, secure use by only authorized users, and recover from file problems," defines:

a) data redundancy

b) data dependence

c) data inaccessibility

*d) none of the above

46. What is the method used to ask something from a database?

a) database demand

b) record recall

*c) query

d) request

e) none of the above

47. SQL stands for:

a) simple query language

*b) structured query language

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c) simple question language

d) structured question language

48. A data _____ is a means of storing and managing data for information access, typically composed of data from one or more transaction databases.

a) base

*b) warehouse

c) entity

d) entry

e) none of the above

49. A data _____ extracts and reorganizes subject-area-specific data.

a) base

b) warehouse

- c) entity
 - d) entry
 - *e) none of the above
50. Reliable data storage and consistent backup procedures are essential in maintaining data:
- a) warehouse
 - b) plan
 - c) recovery
 - *d) integrity
51. The two most commonly used models for designing the organization of a relational database are:
- a) DFDs and ERDs
 - b) ERDs and waterfall models
 - c) SDLC and waterfall
 - d) logical data and DFD
 - *e) none of the above
52. A(n) _____ depicts how data move through a system.
- a) ERD
 - *b) DFD
 - c) logical data
 - d) waterfall model
 - e) none of the above
53. To ensure that user information is in the correct form before sending it is called:
- a) data warehousing
 - *b) data validation
 - c) web hosting
 - d) scripting
 - e) none of the above

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54. Which system uses two keys for its process?
- a) encryption
 - b) decryption
 - c) private key
 - *d) public key
 - e) none of the above
55. The stage of business intelligence that produces useful information from the collected data and information is called:
- *a) data analysis
 - b) data sourcing
 - c) situation awareness
 - d) risk assessment
 - e) decision support

56. The system that enables transaction activities and captures the key data created by the transaction is known as a(n):

- a) document management system
- b) expert system
- *c) transaction processing systems
- d) slicing-and-dicing

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Norrie, Huber, Piercy, McKeown
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Second Canadian Edition
TEST BANK
Chapter 7

1. A _____ is a detailed investigation and analysis of a proposed development project that is undertaken to determine whether it is possible to successfully build the proposed system.

- a) technical study
- b) financial study
- c) tangible study
- *d) feasibility study

2. An organization can determine _____ by examining potential solutions and evaluating these solutions based on its capabilities and the capabilities of any technology partners it may choose to work with.

- a) technical capability
- *b) technical feasibility
- c) financial capability
- d) financial feasibility

3. A project is _____ if the organization can pay for the project, and the project presents a sound investment of the organization's limited resources.

- a) technically capable
- b) technically feasible
- c) financially capable
- *d) financially feasible

4. Some costs and benefits are _____, which means that a value can easily be applied.

- a) realistic
- b) unrealistic
- c) intangible
- *d) tangible

5. Some costs and benefits are _____, meaning they are difficult to measure in monetary terms.

- a) realistic
- b) unrealistic
- *c) intangible
- d) tangible

6. The typical IS team has a(n) _____ that ensures the project goals correspond to the organization's business objectives and is often a senior executive or someone in a position of authority.

a) project manager

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*b) project sponsor

c) account manager

d) analyst

e) developer

7. A(n) _____ actually creates the system itself by coding and deploying the technical infrastructure of the system and programming it to perform required tasks.

a) project manager

b) project sponsor

c) account manager

d) analyst

*e) developer

8. A(n) _____ may have many titles, but they all provide the methods and processes to translate high level requirements in their particular area into lower levels of detail that can be turned into code by programmers.

a) project manager

b) project sponsor

c) account manager

*d) analyst

e) developer

9. A(n) _____ demands knowledge of methods and techniques to ensure delivery of the project on time and on budget, and the ability to communicate project goals and requirements to the project team and to co-ordinate the workflows of everyone on the project team.

*a) project manager

b) project sponsor

c) account manager

d) analyst

e) developer

10. A(n) _____ is responsible for the sales and service of the project team.

a) project manager

b) project sponsor

*c) account manager

d) analyst

e) developer

11. At a high level, the SDLC simply starts with an idea. We call this the:

a) start-up

*b) concept

- c) commencement
- d) initiation

12. Which phase of the SDLC involves the environment within the organization that either promotes or inhibits the development of ideas for systems?

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- *a) concept
- b) inception
- c) elaboration
- d) transition

13. Which phase of the SDLC begins when an organization has the idea to build an information system?

- a) concept
- *b) inception
- c) elaboration
- d) transition

14. In which phase of the SDLC does the project team finalize the requirements for the system and the project plan, and design the system architecture?

- a) concept
- b) inception
- *c) elaboration
- d) transition

15. At which phase of the SDLC does the team finalize the system and put it in place?

- a) concept
- b) inception
- c) elaboration
- *d) transition

16. During which phase of the SDLC does the team build the initial running system?

- *a) construction
- b) transition
- c) production
- d) retirement

17. Once the system is up and running, the organization must continuously monitor, maintain, and evaluate it. This describes which phase in the SDLC?

- a) construction
- b) transition
- *c) production
- d) retirement

18. At some point, the system may lose its value to the company. This phase of the SDLC often marks the concept of a new system to replace the obsolete one.

- a) construction
- b) transition

- c) production
- *d) retirement

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19. A _____ provides a framework for executing both the project management and technical processes of an IS project throughout the life cycle.
- *a) methodology
 - b) plan
 - c) diagram
 - d) chart
20. Initially, system developers tended to work in a very ad hoc way, called the _____ model.
- a) makeshift
 - *b) build-and-fix
 - c) concept
 - d) none of the above
21. With a(n) _____ model, developers first investigate, specify, and implement an important core part of the system with minimal functionality.
- a) prototype
 - *b) evolutionary
 - c) waterfall
 - d) build-and-fix
22. With _____, the project team works with customers to progressively build the system from an initial outline specification using visual mock-ups of screens, diagrams of data relationships, and similar tools that help users see what is going to be built.
- *a) prototyping
 - b) construction
 - c) agile development
23. Because a(n) _____ process is designed to satisfy continuously changing requirements, the team develops software in short development cycles or increments.
- a) prototype
 - b) construction
 - *c) agile
24. A(n) _____ is a simplified representation of something real, such as a building, weather pattern, or information system that business professionals can manipulate to study the real item in more detail.
- a) prototype
 - *b) model
 - c) uml
 - d) html
25. _____ has become a very popular modelling tool, as it works particularly well for developing object-oriented systems.
- a) Hypertext Markup Language (HTML)

- b) Extensible Markup Language (XML)
- *c) Unified Modelling Language (UML)

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- d) Integrated Development Environments (IDEs)
26. Together, the set of UML diagrams is known as the _____ model.
- a) unified
 - b) agile
 - c) prototype
 - *d) system
27. The UML _____ diagram notation captures all the possible ways to use a system.
- a) system
 - *b) use case
 - c) sequence
 - d) waterfall
28. A(n) _____ diagram, which shows the order of various activities and by who, and how they interact with the various system components as they occur in order.
- a) system
 - b) use case
 - *c) sequence
 - d) waterfall
29. Instead of using separate software packages, a(n) _____ allows developers to complete several programming tasks within the same software application.
- a) Hypertext Markup Language (HTML)
 - b) Extensible Markup Language (XML)
 - c) Unified Modelling Language (UML)
 - *d) Integrated Development Environments (IDEs)
30. With _____, a developer can use graphical diagrams to define a system's components and how they are related.
- *a) Code generation
 - b) Integrated Development Environments (IDEs)
 - c) Use case diagrams
 - d) Sequence diagrams
 - e) Unified Modelling Language (UML)
31. _____ is/are the use of computer-based support in the software development process.
- a) Code generation
 - *b) CASE tools
 - c) Use case diagrams
 - d) Sequence diagrams
 - e) Unified modelling language (UML)
32. This syndrome occurs when there is an overreliance on the tools for the success of the project, while neglecting the other pillars of a development project:

a) Down syndrome

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*b) silver bullet syndrome

c) China syndrome

d) none of the above

33. Project _____ is “the application of knowledge skills, tools, and techniques to project activities to meet project requirements.”

a) planning

b) inception

c) scope

*d) management

e) retirement

34. The client may prefer to focus on a set time deadline for receiving the final software, often at the expense of incorporating every single last requirement. This is known as:

a) scoping

*b) descoping

c) scaling

d) descaling

35. Which of the following is NOT one of the elements of the triple constraint in project management?

*a) people

b) budget

c) time

d) quality

36. Which of the following is NOT a core function of the project management methodology?

a) time management

b) cost management

c) scope management

d) quality management

*e) HR management

37. Which of the following is NOT a facilitating function of the project management methodology?

a) risk management

b) procurement management

c) communications management

*d) quality management

e) HR management

38. Which of the following is NOT a main activity of project time management?

a) estimate activity resources

b) estimate activity durations

*c) system activities

d) develop schedule

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39. _____ provide a standard format for displaying the results of the first four time management activities.

*a) Gantt charts

b) Gantt plans

c) Project plans

d) Project charts

e) None of the above

40. The activity of managing several projects together is known as:

a) project management

b) product management

*c) program management

d) none of the above

41. The _____ is the sequence of tasks that determines the overall completion time of the project.

a) slack path

b) project path

c) gantt path

*d) critical path

42. Tasks not on the critical path may have the luxury of extra time, called _____, for completing the work.

*a) slack

b) flop

c) space

43. UML stands for:

*a) unified modelling language

b) unified markup language

c) united modelling language

d) united markup language

44. Together, a the set of UML diagrams is known as the:

a) waterfall model

b) DFD

c) ERD

*d) system model

45. The UML _____ captures all the possible ways to use a system.

*a) use case diagram

b) sequence diagram

c) entity diagram

d) system model

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46. Organizations use a UML _____ to view the interactions between system components as they occur.
- a) use case diagram
 - *b) sequence diagram
 - c) entity diagram
 - d) system model
47. What is the common application used for managing projects?
- a) Microsoft Word
 - b) Microsoft Excel
 - c) Microsoft Access
 - *d) Microsoft Project
48. In addition to time, cost, scope and quality, what is the other choice an organization must consider?
- a) people
 - *b) strategy
 - c) government
 - d) all of the above
 - e) none of the above
49. Which model is a document-driven and highly structured process?
- a) development life cycle
 - *b) waterfall model
 - c) build-and-fix model
 - d) none of the above
 - e) all of the above
50. Developers first investigate, specify and implement an important core part of the system with minimal functionality with which model?
- a) development life cycle
 - b) waterfall model
 - c) build-and-fix model
 - *d) none of the above
 - e) all of the above
51. The following methodology provides a project team with structure to ensure that everyone works toward the same project goals:
- *a) development life cycle
 - b) waterfall model
 - c) build-and-fix model
 - d) none of the above
 - e) all of the above
52. The first development model to gain wide acceptance among system developers was based on the:

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- a) development life cycle
 - *b) waterfall model
 - c) build-and-fix model
 - d) none of the above
 - e) all of the above
53. A _____ should begin as part of the feasibility study:
- *a) stakeholder analysis
 - b) financial analysis
 - c) testing
 - d) prototyping
54. The original ad hoc methodology was called:
- a) development life cycle
 - b) waterfall model
 - *c) build-and-fix model
 - d) none of the above
 - e) all of the above
55. The process of understanding the IS project and defining the requirements is known as:
- *a) system development
 - b) project development
 - c) project management
 - d) system management
 - e) none of the above
56. System analysis and design projects contain all of the following essential ingredients:
- a) finances, HR, IT, management
 - *b) people, methodology, management and tools
 - c) both of the above are correct
 - d) none of the above are correct
57. A _____ study determines whether a project is technically and economically viable.
- a) technical
 - b) compatibility
 - *c) feasibility
 - d) conceptual
58. Tangible refers to:
- a) a cost or benefit that is difficult to quantify
 - b) an orange-like fruit
 - *c) a cost or benefit that is easy to quantify
 - d) none of the above
59. Intangible refers to:

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- *a) a cost or benefit that is difficult to quantify
 - b) an orange-like fruit
 - c) a cost or benefit that is easy to quantify
 - d) none of the above
60. A(n) _____ combines software development tools into one package.
- a) application software
 - *b) IDE
 - c) project management software
 - d) UML
61. When a company is selecting which project to go with, which of the following statements is the most accurate?
- a) a company will choose the one that is most financially beneficial, ignoring all other benefits
 - b) a company will choose the one that has the highest benefits all round
 - c) a company will choose to proceed with a project even if it is not prudent, but out of necessity
 - d) A and B
 - *e) B and C
62. To determine economic feasibility, companies typically use all of the following EXCEPT:
- *a) GIGO
 - b) IRR
 - c) ROI
 - d) NPV
 - e) none of the above
63. A(n) _____ chart is used to show the sequences of project activities and to identify the critical path.
- a) data flow
 - b) Gantt
 - *c) PERT
 - d) ERD
 - e) Pareto
64. Which is NOT a phase of an IS during its life cycle?
- a) pre-inception
 - *b) collaboration
 - c) elaboration
 - d) construction
65. The deliverables of the transition stage include all of the following EXCEPT:
- a) program code
 - b) test documents
 - c) user documentation
 - d) complete system
 - *e) cost-benefit analysis

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66. A _____ is a detailed investigation and analysis of a proposed development project, to determine whether it is technically and economically possible.
- a) projection study
 - *b) feasibility study
 - c) investigation
 - d) proposal
67. At which development phase does an organization finalize an IS and put it in place?
- a) construction
 - b) inception
 - c) production
 - *d) transition
68. Methods that can be used to provide a framework for an IS project include all of the following EXCEPT:
- a) waterfall model
 - b) evolutionary model
 - *c) diagnostic model
 - d) prototyping
 - e) agile development
69. All of the following IS development tools are available to project teams EXCEPT:
- a) models
 - *b) IADD
 - c) integrated development environments
 - d) code generation
 - e) CASE tools
70. The first phase of a project is often known as:
- a) commencement
 - b) injection
 - c) kickoff
 - *d) inception
71. Which one of the following IS project team skills represents a knowledge of techniques for ensuring that a project is successfully completed on time?
- a) architecture and design
 - b) client interface
 - c) programming
 - *d) project management
72. Which of the following is not an agile development method?
- a) extreme programming (XP)
 - *b) diamond family
 - c) rational unified process (RUP)

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d) scrum

73. At which phase does an organization finalize an IS and put it in place?

a) construction

b) inception

c) production

*d) transition

74. A word or words that describe retirement as part of the life cycle of an IS development project is a(n):

a) idea

b) finalizes the requirements

c) finalizes and puts in place

d) monitors, maintains, evaluates

*e) none of the above

75. A word or words that describe transition as part of the life cycle of an IS development project is a(n):

a) idea

b) finalizes the requirements

*c) finalizes and puts in place

d) monitors, maintains, evaluates

76. A word or words that describe production as part of the life cycle of an IS development project is a(n):

a) idea

b) finalizes the requirements

c) finalizes and puts in place

*d) monitors, maintains, evaluates

e) none of the above

77. A word or words that describe elaboration as part of the life cycle of an IS development project is a(n):

a) idea

*b) finalizes the requirements

c) finalizes and puts in place

d) monitors, maintains, evaluates

e) none of the above

78. A word or words that describe construction as part of the life cycle of an IS development project is a(n):

a) idea

b) finalizes the requirements

c) finalizes and puts in place

d) monitors, maintains, evaluates

*e) none of the above

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79. A word or words that describe inception as part of the life cycle of an IS development project is a(n):

- *a) idea
- b) finalizes the requirements
- c) finalizes and puts in place
- d) monitors, maintains, evaluates
- e) none of the above

80. The analysis of the waterfall model includes all of the following phases EXCEPT:

- a) project planning
- *b) error detection
- c) requirements definition
- d) system modeling
- e) design

81. Prototyping may be described as an:

- a) IS methodology that continuously changes to meet new requirements
- *b) IS methodology that produces an example for customers
- c) IS methodology that produces partial running systems
- d) IS methodology that uses phases to create a system
- e) IS methodology that uses parts of all methodologies to create a new system

82. Project management tasks include all of the following activities EXCEPT:

- a) project scope management
- b) time management
- c) cost management
- d) quality management
- *e) analysis and design

83. Options for obtaining an information system include all of the following EXCEPT:

- a) acquire
- b) build
- *c) test
- d) lease

84. All of the following are core functions that lead to specific project objectives EXCEPT:

- *a) risk management
- b) project scope management
- c) time management
- d) cost management
- e) quality management

85. What is the response for assigning the risk to someone who is more able to deal with it?

- *a) risk transfer
- b) risk deferral

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- c) risk reduction
 - d) risk acceptance
86. What is action for knowing that risks will occur and ensuring that contingency plans are in place?
- a) risk reduction
 - *b) risk acceptance
 - c) risk avoidance
 - d) risk transfer
87. The scope and complexity of an IS development project is:
- a) easy to manage
 - b) cannot be managed
 - *c) difficult to manage
 - d) a long-range goal
88. What helps the project manager to ensure that the project is meeting the schedule, budget, and quality targets?
- *a) time tracking
 - b) task scheduling
 - c) collaboration
 - d) estimating
89. What PM software includes a shared database as well as email, chat, and virtual meeting capabilities?
- a) time tracking
 - b) task scheduling
 - *c) collaboration
 - d) estimating
90. Integrated development environment includes all of the following EXCEPT:
- a) text editor to write program code
 - b) file system to store programs
 - c) debugging tools to find and correct errors
 - *d) collaboration features to connect pieces of a project
91. Which is not a phase of an IS during its life cycle?
- a) pre-inception
 - *b) collaboration
 - c) elaboration
 - d) construction
92. Project strategy is defined as:
- *a) the ability to ensure that the project goals correspond to the organization's business objectives

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- b) knowledge of methods and techniques to ensure delivery of the project on time and on budget
 - c) responsibility for the sales and service of the project team
 - d) a process that continuously monitors and improves a process
93. The deliverables of the implementation stage include all of the following EXCEPT:
- a) program code
 - b) test documents
 - c) user documentation
 - d) complete system
 - *e) detailed records of changes
94. All of the following methods are used by businesses to deal with risk EXCEPT:
- a) risk avoidance
 - b) risk acceptance
 - *c) risk-safety matrix
 - d) risk transfer
 - e) risk deferral
95. Postponing exposure to risk until resources are available to address risk defines:
- *a) risk deferral
 - b) risk transfer
 - c) risk reduction
 - d) risk avoidance
 - e) risk management
96. Risks are unavoidable; however, making sure that contingency plans are in place defines:
- a) risk deferral
 - b) risk transfer
 - *c) risk acceptance
 - d) risk avoidance
 - e) risk management
97. Which one of the following is not an organizational response to risk?
- a) risk acceptance
 - b) risk avoidance
 - *c) risk behaviour
 - d) risk reduction
98. Which of the following is true about performing a stakeholder analysis?
- a) The group of stakeholders analyzed includes anyone who has a stake in the project and may affect the outcome of the project.
 - b) An attempt is made to judge the attitude of a stakeholder toward the project.
 - c) In order to mitigate the risk associated with each stakeholder, a project team member is assigned to implement stakeholder management strategies.
 - *d) All of the above

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e) None of the above

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Chapter 8

1. Moving from a passive site that basically displays information to a site that permits interaction with visitors or users is commonly referred to as _____ web.

- *a) interactive
- b) dynamic
- c) static
- d) generated
- e) automatic

2. Blogs and conversation threads are commonly referred to as:

- *a) user-generated content (UGC)
- b) semantic web
- c) social utility
- d) invitational design

3. _____ is a next-generation—but not separate—web that makes information sharing and exchange easier by focusing on content, searchability, and interpretability at a technical level.

- a) User-generated content (UGC)
- *b) The semantic web
- c) Social utility
- d) Invitational design

4. Which term suggests that you only spend time on sites that are useful to you, and that the time invested on the site somehow contributes to your happiness or social satisfaction, or creates social opportunities for you?

- a) user-generated content (UGC)
- b) semantic web
- *c) social utility
- d) invitational design

5. Which of the following is NOT one of the Three Pillars of Sociability?

- a) validate
 - *b) regulate
 - c) participate
 - d) affiliate
6. What is the name of the legal instrument that Canada uses to protect privacy?
- a) Sarbanes-Oxley
 - b) FIPPA

hzzled

- *c) PIPEDA
 - d) None of the above
7. _____ involves associating keywords with your content to make it searchable so that other users can locate it and interact with it.
- a) Relating
 - b) Imaging
 - *c) Tagging
 - d) Collecting
8. When content (such as a YouTube video) instantly spreads online from its origins to nearly every corner of the world, it is considered to have:
- a) gone mental
 - *b) gone viral
 - c) gone spiral
 - d) gone high
9. Going viral is in keeping with the psychological concept of:
- *a) Schadenfreude
 - b) Freudism
 - c) folksonomy
 - d) acceptance
10. A situation where a traditional brand faces an online storm that can quite literally damage the value of its brand overnight is known as:
- a) mashup
 - *b) brandstorm
 - c) viral
11. When messages, offers, or promotions that come from the company to the consumer in some form, this is an example of:
- a) indirect
 - *b) direct
 - c) perfect
 - d) imperfect
12. What others were saying or doing with products became more important, and consumers began to seek out _____ sources of information
- *a) indirect

- b) direct
- c) perfect
- d) imperfect

13. What are purpose-built sites (or forums or groups) designed to meet a specific need called?

- a) platform plays
- b) platform wars

hzzled

*c) micromarkets

d) macromarkets

14. Making sure your brand and advertising messages are coherent and consistent is called:

- a) direct marketing
- b) indirect marketing
- *c) media transparency
- d) brandstorm

15. Which of the following is NOT a benefit of social computing in new ways?

- a) conducting online focus groups for new product development
- b) running viral campaigns to launch new products
- c) holding virtual recruiting and job fairs in Second Life
- *d) using social media tools to move from a podcast to broadcast model for training and development and internal communication with employees

16. According to the text, what should have Ford North America done to improve their customer feedback site in the early stages?

- a) delete any negative feedback
- b) let their loyal customers come to their rescue
- *c) done nothing
- d) delete the site entirely

17. The increase in video content on the internet has allowed marketing to _____ the use of traditional television stations.

- *a) become more targeted than
- b) become less targeted than
- c) be about the same as
- d) none of the above

18. CPC stands for:

- *a) cost per click
- b) conservative persons coalition
- c) Canadian privacy co-operative
- d) none of the above

hzzled

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Chapter 9

1. _____ are fundamental beliefs that you hold as true about the way the world works and your role in it.
 - a) Ethics
 - *b) Personal values
 - c) Moral codes
 - d) Legal codes
2. A suggestion that you need to maintain your personal integrity and act consistently by applying a personal code of conduct about what is right and wrong describes:
 - *a) ethics
 - b) personal values
 - c) moral codes
 - d) legal codes
3. Those who are not following the rules or who are at risk of being criminal are called:
 - a) offenders
 - *b) outliers
 - c) outlaws
 - d) none of the above
4. Which school of thought promotes making social agendas and social responsibilities equal to the profit imperative, and balancing economic and social factors in all business decisions?
 - a) moral codes
 - b) ethical dilemmas
 - *c) corporate social responsibility
 - d) personal values
5. Much of the recent discussions about the collateral costs of doing business on things like the environment are called:
 - a) internalities
 - *b) externalities
 - c) outliers
 - d) ethics
6. _____ can be simply defined as the highest level of decision making, involving basic questions of status, strategy, and compliance within an organization.
 - a) IT governance
 - b) Board governance

hzzled

c) Organizational governance

*d) Corporate governance

7. The distribution of IT decision-making rights and responsibilities among enterprise stakeholders, and the procedures and mechanisms for making and monitoring strategic decisions regarding IT defines:

a) corporate governance

b) corporate policy

*c) IT governance

d) IT policy

8. Which legal instrument sets out the ground rules that protects Canadians' privacy at a federal level?

a) Sarbanes-Oxley

b) Bill 198

c) Multilateral Instrument 52-109

*d) PIPEDA

9. _____ help guide the professionals within the field in terms of what is and is not acceptable and ethical behaviour.

a) Codes of behaviour

*b) Codes of conduct

c) Codes of ethics

d) Codes of law

10. Copying any protected software which the license clearly does not permit, is an unethical practice. This describes:

*a) piracy

b) infection by virus

11. Which of the following statements best describes business ethics?

a) getting the work done quickly

b) getting the work done right regardless of the method

c) getting the work as cheaply as possible

*d) getting the work done following the rules

e) getting the work done effectively

12. Which of the following statements best explains why software piracy is both illegal and unethical?

*a) Software piracy is considered wrong because of the act of stealing and unethical because it violates the "do no harm" principle.

b) Software piracy violates federal law.

c) Software piracy means a loss of income to software companies, thus making the software more expensive for the consumer.

d) Software piracy may make it more difficult for an information worker to get his or her work done.

hzzled

13. The _____ concept allows the use of copyrighted materials for limited and transformative purpose.
- a) DRM
 - b) IADD
 - c) intellectual property
 - *d) fair dealing
14. When downloading materials found on the Internet to use in a company report, which of the following parts/ideas of federal laws must be taken into consideration?
- a) DRM
 - b) intellectual property
 - c) fair dealing
 - d) A and B
 - *e) A and C
15. _____ is any creation of the mind, including inventions, literary, and artistic works.
- *a) Intellectual property
 - b) Digital rights media
 - c) Digital rights management
 - d) Fair dealing
 - e) None of the above
16. The technological means of copyright enforcement is called:
- a) intellectual property
 - b) digital rights media
 - *c) digital rights management
 - d) fair dealing
 - e) none of the above
17. The concept of Canadian copyright law allows the use of copyrighted material for purposes of private study or research, criticism, review or news reporting. What is this known as?
- a) intellectual property
 - b) digital rights media
 - c) digital rights management
 - *d) fair dealing
 - e) none of the above
18. A _____ is a set of procedures and philosophies that a company adopts to handle individually identifiable private information.
- a) procedure manual
 - *b) privacy policy
 - c) authentication policies
 - d) project charter
 - e) none of the above

hzzled

19. Any organization, especially one engaged in e-commerce, has a responsibility for adopting policies for dealing with private information and making these policies public. This defines:

- *a) adoption and implementation of a privacy policy
- b) notice and disclosure
- c) choice and consent
- d) data security
- e) none of the above

20. The policy should be easy to obtain and understand and be available before private data are collected. It should clearly explain what data will be collected and how they will be used. This defines:

- a) adoption and implementation of a privacy policy
- *b) notice and disclosure
- c) choice and consent
- d) data security
- e) none of the above

21. Individuals should be given the right to choose how their identifiable information may be used when the use is unrelated to the purpose for which the data are being collected. This defines:

- a) adoption and implementation of a privacy policy
- b) notice and disclosure
- *c) choice and consent
- d) data security
- e) none of the above

22. Businesses that collect private information should take reasonable steps to make sure the data are reliable and protected from misuse. This defines:

- a) adoption and implementation of a privacy policy
- b) notice and disclosure
- c) choice and consent
- *d) data security
- e) none of the above

23. Businesses collecting private information should take reasonable steps to make sure that data are accurate, complete, and timely. They should also provide individuals access to their private data and the opportunity to correct inaccuracies if they are found. This defines:

- a) adoption and implementation of a privacy policy
- b) notice and disclosure
- c) choice and consent
- d) data security
- *e) none of the above

24. A set of procedures and philosophies that a company adopts to handle individually identifiable private information is known as a(n):

a) spot buying

hzzled

b) m-commerce

c) CRM

*d) privacy policy

25. In Canada, which act ensures that companies are responsible for the data they collect?

a) Sarbanes-Oxley (SOX)

*b) PIPEDA

c) Charter of Rights and Freedoms

d) Freedom of Information Act

e) None of the above

26. Personal Information Protection and Electronic Documents Act (PIPEDA):

*a) sets ground rules for how private sector organizations may collect, use, or disclose personal information

b) holds company's officers personally responsible for providing accurate public financial information to investors

c) focuses on personal health information

d) foundations of enterprise information security

27. ____ is the learned behaviour of people which includes their belief systems and languages, and their material goods.

a) Psychology

b) Philanthropy

*c) Culture

d) Philosophy

28. What law instrument is used in Canada to protect people's privacy?

a) Sarbanes-Oxley Act

b) Multilateral Instrument 52-109

c) EU Data Protection Directive

*d) PIPEDA

e) None of the above

29. CIO stands for:

*a) chief information officer

b) chief infrastructure officer

c) commanding information officer

d) commanding internet official

e) none of the above

30. The leadership and management of a business are directly accountable to its owners defines:

a) effective governance

b) IT Governance

*c) corporate governance

d) less-robust governance

hzzled

31. The distribution of IT decision-making rights and responsibilities among enterprise stakeholder describes:
- a) effective governance
 - *b) IT Governance
 - c) corporate governance
 - d) less-robust governance
32. IT governance is:
- a) how the organization will set goals, objectives, priorities, and policies for IT
 - b) how it will integrate IT with business strategies and goals
 - c) which organizational members will make decisions regarding the successful completion of these task
 - *d) all of the above
 - e) none of the above
33. Enterprise information security rests on the foundation of:
- *a) business and IT governance
 - b) enterprise risk
 - c) security standards
 - d) business values
34. The primary focus of IT governance is on:
- *a) decision rights associated with IT
 - b) information processing
 - c) network vulnerabilities
 - d) technology acquisition and modernization

hzzled

08 September 2020

Week 1: Introduction to IS and IT

Information technology: computer-based tool that people use to work with information and to support the information and information-processing needs of an organization

Information systems: A tool to collect, process, store, analyze, and disseminate information for a specific purpose.

- Purpose of IS:
 - get the **right information** to the **right people** at the **right time** in the **right amount** and in the **right format** to support business processes and decision making.

- IS INCLUDES IT

Why study information systems?

- You are the most connected generation in history and you practice continuous computing, so you are comfortable using IT.
- The next step is to become an informed user. An informed user is a person knowledgeable about information systems and information technology
- Why be an informed user?
 - benefit more from your organization's IT applications because you will understand what is "behind" those applications.

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- be in a position to enhance the quality of your organization's IT applications with your input.
- be in a position to recommend the IT applications that your organization will use.
- keep abreast of both new information technologies and rapid developments in existing technologies.
- understand how using IT can improve your organizations performance and teamwork as well as your own productivity.
- help you use IT when you start your own business.

Computer-based information systems

- The transformation of data to information and knowledge
- Components of a computer-based information system (CBIS)
- Major capabilities of information systems
- Types of CBIS
- Breadth of support of information systems (TPS and ERP- enterprise resource planning system)
- Support for organizational employees

Data, information and knowledge

- **Data** is sorted, processed or assembled to create **information** .
- When people apply learned criteria or learned expertise to **information** they create **knowledge**
- Information has more structure and value and is organized in a way in which it gives meaning
 - Therefore we used knowledge to make decisions
 - The better structure, the more organized the more it makes sense the better knowledge it becomes, the more value it has to us as an organization
 - Allowing us to reduce risk, bc accurate information helps us make better decisions we have less likelihood of getting it wrong
- Efficiency = do more with less
- Effectiveness = do more towards reaching our goal

Value of information

11

IT inside an organization

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Major capabilities of information systems

- Perform high speed, high volume numerical computations
- Provide fast, accurate communication and collaboration within and among organizations
- Store huge amounts of information in an easy to access, yet small space
- Allow quick and inexpensive access to vast amounts of information, worldwide
- Interpret vast amounts of data quickly and efficiently
- Automate both semiautomatic business processes and manual tasks

How IT impacts organizations

- Industries disappear or are transformed, new ones appear
- IT changes the way managers work and reduces their numbers
- Employees are affected numerous ways

Impact on management

1. Makes managers more productive, increasing the number of employees reporting to managers
2. Impact is that it reduces the number of middle managers
- 13
3. Changes the manager's job by changing the way the manager makes decisions
 - a. Less time to make decisions
 - b. New IT tools to analyze high volumes and complex data
4. More remote supervision of employees due to telecommuting

Impact on workers

- May eliminate jobs
- Potential loss of identity and alienation
- Potential repetitive strain injury (RSI) or vision issues
- Provides opportunities for people with disabilities by using assistive technologies

Importance of IT in society in general

- Quality of Life:
 - Healthcare
 - Education
 - Banking
 - Teleworking
- Social media
- Cryptocurrencies
- Artificial intelligence
- Robotics

September 15th 2020

Hardware

All questions from the quizzes and exam are from the book on wiley
Hardware consists of the following:

- **Central processing unit (CPU):** Manipulates the data and controls the tasks performed by the other components.

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- **Primary storage:** Temporarily stores data and program instructions during processing.
- **Secondary storage:** Stores data and programs for future use.
- **Input technologies:** Accept data and instructions and convert them to a form that the computer can understand.

- **Output Technologies:** Present data and information in a form people can understand.
- **Communication technologies:** Provide for the flow of data from external computer networks (e.g., the Internet and intranets) to the CPU, and from the CPU to computer networks.

5 Components of Information Systems

- **Hardware:** the equipment, such as a computer, printers and other physical devices
- **Software:** what makes the hardware do stuff that is useful to us
- **Business processes:** what we do, in part with the software but also with the data
- **Data:** the information we need for the business processes and the software
- **People:** the individuals, the users of information systems, who create value and use them

Evolution of the Modern IT Infrastructure

1. Stand-alone Mainframes
2. Mainframe and Dumb Terminals
3. Stand-alone Personal Computers
4. Local Area Networks (Client/Server Computing)
5. Enterprise Computing
6. Cloud Computing and Mobile Computing

2.2 Strategic Hardware Issues

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- How do organizations keep up with the rapid price reductions and performance advancements in hardware? For example, how often should an organization upgrade its computers and storage systems? Will upgrades increase personal and organizational productivity? How can organizations measure such increases?
- How should organizations determine the need for the new hardware infrastructures, such as cloud computing? (We discuss cloud computing in Technology Guide 4.)
- Portable computers and advanced communications technologies have enabled employees to work from home or from anywhere. Will these new work styles benefit employees and the organization? How do organizations manage such new work styles?
- How do organizations manage employees who use their own portable devices (e.g., tablets and smartphones) for both personal and work purposes? That is, how do organizations handle the bring-your-own-device phenomenon?

2.3 Computer Hierarchy

Supercomputers

- The term supercomputer indicates the fastest computers available at any given time.
- At the time of this writing (mid-2016), the fastest supercomputers boasted speeds exceeding 30 petaflops.
- (One petaflop is 1,000 trillion floating point operations per second.)
- A floating point operation is an arithmetic operation involving decimals.
- Large organizations use supercomputers to execute computationally demanding tasks involving very large data sets, such as military and scientific applications.
- In the business environment, for example, large banks employ supercomputers to calculate the risks and returns of various investment strategies, and health care organizations use them to analyze giant databases of patient data to determine

optimal treatments for various diseases.

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Mainframe Computers

- Mainframes remain popular in large enterprises for extensive computing applications that are accessed by thousands of users at one time.
- Today's mainframes perform at teraflop (trillions of floating point operations per second) speeds and can handle millions of transactions per day.
- In addition, mainframes provide a secure, robust environment in which to run strategic, mission-critical applications.

Microcomputers

Microcomputers (also called micros, personal computers, or PCs) are small, complete, general purpose computers.

Laptop and Notebook Computers

- Laptop and notebook computers are small, easily transportable, lightweight computers
- They provide users with access to processing power and data outside an office environment.
- Even though the price of personal computers has been falling exponentially, the decision about which kind of computer to buy is still an important one, as shown in IT's Personal.

Tablet Computers

A tablet computer, or simply tablet, is a complete computer contained entirely in a flat touch screen that users operate via a stylus, a digital pen, or their fingertip instead of a keyboard or mouse.

Wearable Computers (Wearables)

Wearables are miniature computers that people wear under, with, or on top of their clothing.

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Key features of wearables are that there is constant interaction between the computer and the users and that users can multitask, meaning that they do not have to stop what they are doing to use the device.

Moore's Law

Moore's law describes the empirical regularity that the number of transistors on integrated circuits doubles approximately every two years. This advancement is important as other aspects of technological progress - such as processing speed or the price of electronic products - are linked to Moore's law.

1. The number of transistors on integrated circuits **doubles** every 2 years
2. The speed of these processors increases
3. And price drops

Microprocessors keep getting:

- Smaller and smaller
- Become faster and faster
- And cheaper and cheaper

And the same applies to computers bc of the above^

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2.4 Input and Output Technology

Input technologies allow people and other technologies to enter data into a computer. The two main types of input devices are human data-entry devices and source-data automation

devices. As their name implies, human data-entry devices require a certain amount of human effort to input data. Examples are keyboard, mouse, pointing stick, trackball, joystick, touch screen, stylus, and voice recognition.

In contrast, source-data automation devices input data with minimal human intervention. These technologies speed up data collection, reduce errors, and gather data at the source of a transaction or other event. Barcode readers are an example of source-data automation. Table 2.1 describes the various input devices.

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INPUT

DEVICE CHARACTERISTICS

Human Data-Entry Devices

Keyboard Most common input device (for text and numerical data).

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Mouse Handheld devices used to place the cursor at a point on screen, such as an icon; the user clicks a button on the mouse, instructing the computer to take some action.

Optical

mouse

The mouse is not connected to the computer by a cable; rather, it uses a camera chip to take images of the surface it passes over, comparing successive images to determine its position.

Trackball User rotates a ball built into the top of the device to move the cursor (rather than moving an entire device, such as a mouse).

Pointing stick Small button-like device; the cursor moves in the direction of the pressure the user places on the stick. Located between the keys near the centre of the keyboard.

Touchpad User moves the cursor by sliding a finger across a sensitized pad (also called a trackpad or a glide-and-tap pad) and then tapping the pad when the cursor is in the desired position to instruct the computer to take action.

Graphics

tablet

A device that can be used in place of, or in conjunction with, a mouse or trackball; it has a flat surface for drawing and a pen or stylus that is programmed to work with the tablet.

Joystick The joystick moves the cursor to the desired place on the screen; commonly used in video games and in workstations that display dynamic graphics.

Touch screen Users instruct the computer to take some action by touching a particular part of the screen; commonly used in information kiosks such as ATM machines. Touch screens now have gesture controls for browsing through photographs, moving objects around on a screen, flicking to turn the page of a book, and playing video games.

Stylus Pen-style device that allows users either to touch parts of a predetermined menu of options or to handwrite information into the computer; works with touch-sensitive screens.

Digital pen Mobile devices that digitally capture everything you write; built-in screen confirms that what you write has been saved; also captures sketches, figures, and so on with on-board flash memory.

Web camera

(webcam)

A real-time video camera whose images can be accessed via the Web or instant messaging.

Voice

recognition

Microphone converts analogue voice sounds into digital input for a computer; critical technology for physically challenged people who cannot use other input devices.

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Microsoft

Kinect

A device that enables users to control and interact with the Xbox 360 through a natural interface using gestures and spoken commands. Kinect eliminates the need for a game controller.

Leap Motion

Controller

A motion-sensing, matchbox-sized device placed on a physical desktop. Using two cameras, the device “observes” an area up to a distance of about one metre. It precisely tracks fingers or items such as a pen that cross into the observed area. The Leap can perform tasks such as navigating a website, using pinch-to-zoom gestures on maps, performing high-precision drawing, and manipulating complex three-dimensional visualizations.

Source-Data Automation Input Devices

Magnetic

stripe reader

A device that reads data from a magnetic stripe, usually on the back of a plastic card (e.g., credit and debit cards).

Barcode

scanners

Devices that scan black-and-white barcode lines printed on merchandise labels.

Optical mark

reader

Scanner for detecting the presence of dark marks on a predetermined grid, such as multiple-choice test answer sheets.

Magnetic ink

character

reader

A device that reads magnetic ink printed on cheques that identify the bank, chequing account, and cheque number.

Optical

character

recognition

Software that converts text into digital form for input into a computer.

Sensors Devices that collect data directly from the environment and input data directly into a computer; examples are vehicle airbag activation sensors and radio-frequency identification tags.

Cameras Digital cameras capture images and convert them into digital files.

Radio-freque

ncy
identification
(RFID)

Uses technology that contains active or passive tags (transmitters) to wirelessly transmit product information to electronic readers. (We discussed RFID in detail in Chapter 8.)

Wii The wireless controller of the video game console by Nintendo, which can be used as a handheld pointing device and can detect movement in three dimensions.

Gesture Recognition

- Gesture-based input or gesture recognition involves technologies that enable computers to interpret human gestures.
- These technologies would be the first step in designing computers that can understand human body language.
- This process creates a richer interaction between machines and humans than has been possible via keyboards, graphical user interfaces, and the mouse.
- Gesture recognition enables humans to interact naturally with a computer without any intervening mechanical devices.
- With gesture-based technologies, the user can move the cursor by pointing a finger at a computer screen. These technologies could make conventional input devices (the mouse, keyboards, and touch screens) redundant.

The output generated by a computer can be transmitted to the user via several output devices and media.

22

OUTPUT

DEVICE DESCRIPTION

Monitors

Cathode ray

tubes

Video screens on which an electron beam illuminates pixels on a display screen.

Liquid crystal

displays

(LCDs)

Flat displays that have liquid crystals between two polarizers to form characters and images on a backlit screen.

Flexible

displays

Thin, plastic, bendable computer screens.

Organic

light-emitting

diodes

Displays that are brighter, thinner, lighter, cheaper, faster, and take less power to run than LCDs.

Retinal

scanning

displays

Displays that project an image directly onto a viewer's retina; used in medicine, air traffic control, and industrial machines.

Heads-up displays

Any transparent display that presents data without requiring the user to look away from his or her usual viewpoint.

- Multimedia technology is the computer-based integration of text, sound, still images, animation, and digitized motion video.
- It usually consists of a collection of various input and output technologies.
- Multimedia merges the capabilities of computers with televisions, CD players, DVD players, video and audio recording equipment, and music and gaming technologies.
- High-quality multimedia processing requires powerful microprocessors and extensive memory capacity, including both primary and secondary storage.

23

Video

projector/poc

ket projector

Projects the images from a computer monitor onto a mounted screen or wall with a white background. A pocket projector in a handheld device provides an alternative display method to alleviate the problem of tiny display screens in handheld devices.

Printers

Laser Use laser beams to write information on photosensitive drums; produce high-resolution text and graphics.

Inkjet Shoot fine streams of coloured ink onto paper; usually less expensive to buy than laser printers but can be more expensive to operate; can offer resolution quality equal to laser printers.

Thermal Produce a printed image by selectively heating coated thermal paper; when the paper passes over the thermal print head, the coating turns black in the areas where it is heated, producing an image.

Plotters Use computer-directed pens for creating high-quality images, blueprints, schematics, drawing of new products, and so on.

Voice output A speaker/headset that can output sounds of any type; voice output is a software function that uses this equipment.

Von Neumann Architecture

- CPU = core
- Control unit = control circulation/how things are working
- Arithmetic logic unit (ALU) = does all the math
- RAM = random access memory
- Software and data is found here
- When computer is turned off, info is completely erased
- ROM = read-only memory
- Where basic instructions are
- Start up instructions
- Non volatile
- Memory is where everything is located
- Sending info to CPU

Software and Hardware Relationship

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Software is what makes hardware useful

System software: utilities, operating system

Application software: computer games, spreadsheets, word processors, databases

Introduction to Software

- **Software:** a set of computer programs that enable the hardware to process data
- **Computer program:** the sequence of instructions for the computer, which comprise **software**
- **Documentation:** written description of the functions of a software program
- **Systems software:** a set of instructions that serves primarily as an intermediary between computer hardware and application programs
- **Application software:** a set of computer instructions that provide more specific functionality to a user 1

System software

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Operating system: supervises the overall operation of the computer by monitoring the computer's status, scheduling operations, and managing input and output processes.

Functions performed by systems software:

- Control and support information processing activities
- Control and support peripherals (e.g. printers, keyboard, mouse)
- Enables self-regulatory functions of the computer
- Provides commonly used sets of instructions for all applications
- Supports application software by directing the computer's basic functions

Windows 7 Boot Process

BIOS: basic input-output system

1. BIOS is gonna give the computer a basic information system on how to connect the input and output devices
2. Then it starts to load and initialize the operating system
3. Gonna start loading the kernel
 - a. Which is the core of OS

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4. And then start to initialize the session
5. Which is when you're gonna get the login screen
6. And then the desktop with all its windows

Major Types of Personal Application Software

- Spreadsheets
- Word Processing
- Desktop Publishing
- Data Management
- Presentation
- Graphics
- Personal Information Management
- Personal Finance
- Web Authoring
- Communications

In business we use packaged commercial software, not open source

How the users use the information system

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- Executives are strategic and will use EIS
- They worry more about the big picture

- Senior managers and middle managers are more at a tactical level and are worrying more about day to day stuff
- Workers use TPS typically and use different softwares based on job

Cloud Computing

The externalization, taking out a lot of the processing power, software, application, data to the outside

Making it a commodity rather than an expense

- Provides On-Demand Self-Service
- Enables organizations to utilize resources more efficiently
- Provides fault tolerance and redundancy
- Makes it easy to scale up or down

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Dealing with a third party service provider who you pay based on how much storage you need

- Very cost-efficient
- A lot of variety
- Out on the web and you don't know where
- Potential security and privacy issues
- Maybe some stuff you can't contractually share
- Needs an internet connection

Cloud Computing Services

- INFRASTRUCTURE-AS-A-SERVICE (IAAS)
- PLATFORM-AS-A-SERVICE (PAAS)
- SOFTWARE-AS-A-SERVICE (SAAS)

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3 Major Benefits of Cloud Computing to Individuals & Organizations

1. Positive impact on employees
 - a. Access information anywhere, on any device, across organizational boundaries
2. Can save money
 - a. Reduces or eliminates need to purchase hardware, build and install software and pay software licensing fees
3. Can improve organizational flexibility and competitiveness
 - a. Using only computing resources needed at any given time, can scale operations up or down as needed

September 22 2020

Organizational Strategy, Competitive Advantage

Business Pressures

- Market Pressures
- Technology Pressures
- Societal/Political/Legal Pressures

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Market Pressures

- **Globalization**
 - Businesses are more integrated at a global scale and diverse in function (design in LA, manufacture in China etc)
 - Eg Apple

● **Changing nature of the workforce**

- The workforce is becoming more and more diverse
- Aging population = a lot of baby boomers that need to be replaced at the same time
- More women coming in
- More immigrants
- More minorities are included
- Affirmative action programs
- Single parents

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- Disabilities
- Used to be more manufacturing centered but now shifting towards a more service industry (secondary to tertiary)
- This means there are different needs for different jobs
- Leading to differences in education as well

● **Powerful Customers**

- More sophisticated
- Have different expectations and standards
- More and more knowledgeable products and services
- More information readily available about products and services
- Looking at specs, prices to compare etc

Technology Pressures

● **Technological Innovation and Obsolescence**

- Technology is advancing rapidly
- Lots of innovation going on that's completely changing the business landscape
- New inventions and products that would transform the market
- Disruptive innovation/Creative destruction
- Need to destroy the past to create the new
- Most radical innovation fails
- Which is why corporations opt for slow incremental innovation bc they have too much to lose
- Usually comes from startups bc they have nothing to lose
- Puts a lot of pressure on organisation bc disruptive innovation can make other technology obsolete very fast

● **Information Overload**

- Oversaturated flood of information
- Really difficult for managers to make a decision bc you're afraid you'll make the wrong one
- Need to discern good from bad information
- Check the quality of the information
- Good information = good decision

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- Then there's the risk of making no decision bc of information

Societal, Political, Legal Pressures

● **Societal Responsibility**

- Want to be perceived as good corporate citizens that do the right thing

- How we treat our:
 - Employees
 - Customers
 - Suppliers
 - Things like #MeToo, George Floyd, etc
 - IT assists “Go Green” Efforts in 3 areas:
 - Facilities design and management
 - Carbon management
 - International and US environmental laws
 - Digital divide
 - Second class connection
- **Compliance with Government Regulations**
 - Health and safety
 - Government
 - Environmental
- **Protection Against Terrorist Attacks**
 - Empathetic to all societal issues:
 - Racism
 - Terrorist attacks
- **Ethical Issues**
 - Want to protect our image, customers, employees etc
 - But in doing so it's a complex balancing act for all organisations
 - Want people to trust you and want to work for you, buy from you etc

Organizational Responses

- Strategic systems

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- We’re gonna design, test and implement different types of strategies to try to improve our market share/profits/supplier relationship/product
- Customer focus
 - Restructure how people in the organization think
 - Culture change to try to make sure the employees know that what they're doing has purpose and is going to positively impact the customer
- Your role matters
 - Rethink your business process to make it more appealing and customer friendly
 - Helps bottom line
- Make-to-Order and Mass Customization
 - Taking advantage of new technologies in order to be able to
 - “Industry 4.0” to be able to more easily provide small customizations of different products (eg by using AI, robots, tracking)
 - Eg in fashion
- E-Business and E-Commerce
 - Doing business online is just an example of how businesses have adapted to modern demands and avoid crisis
 - Eg pandemic leading the shift
- Restaurants using third party vendors for sales (eg Uber eats)

- Therefore integrating e-commerce into their business

Competitive Advantage and Strategic IS's

- Porter's Competitive Forces Model
- Porter's Value Chain Model
- Strategies for Competitive Advantage
- Business- IT alignment

Porter's Five Forces Model

1. The threat of new competitors
2. The bargaining power of suppliers
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3. The bargaining power of customers (buyers)
4. The threat of substitute products or services
5. The rivalry among existing firms in the industry

Rivalry Among Existing Firms

- The threat from rivalry is high when there is intense competition among many firms in an industry. The threat is low when the competition is among fewer firms and is not as intense
- Competing for the same customers
- What are the threats?

Threat of Entry of New Competitors

- The threat that new competitors will enter your market is high when entry is easy and low when there are significant barriers to entry
- Eg hotel
- The barriers are high bc its really capital intensive
- Building, furnishing etc
- Then arrives new technology and creates AirBnB!!
- It removed this barrier

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Barrier to Entry

- A product or service feature that customers have learned to expect from organizations in a certain industry
- A competing organization must offer this feature in order to survive the marketplace

Threat of Substitute Products or Services

- If there are many alternatives to an organization products or services, then the threat of substitutes is high
- If there are few alternatives, then the threat is low
- Eg cars in Montreal
- Public transportation, STM, bikes etc

Switching Costs

- The costs, in money and time, imposed by a decision to buy elsewhere (eg contracts with smartphone providers)

Bargaining Power of Suppliers

- Supplier power is high when buyers have few choices from whom to buy and low when buyers have many choices
- Eg Walmart vs little shack

Bargaining Power of Customers (Buyers)

- Buyer power is high when buyers have many choices from whom to buy and low when buyers have few choices
- How much perceived value do the customers have of your product
- The more value, the more I can sell it for

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How do we position ourselves with our suppliers to get better deals when buying supplies(raw materials) , how do we position ourselves with our customers so that we can increase value in their eyes and therefore increase the price justifiably.

Porter's Value Chain

This is a **THEORETICAL MODEL**

- Divided into 2
- Supporting Activities
- Provide services to all aspects of the company
- Primary Activities
- Activities that are creating value
- The difference between value we are creating in Primary and cost we are incurring in Support is our margin

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- We can re-use this margin and invest it back into the business or give it to stakeholders (dividends etc)

Value Chain

- A sequence of activities
- Inputs are transformed into more valuable outputs
- This chain of events creates value

Value System

- The suppliers that provide the inputs
- The firm creates products
- These products pass through the value chains of distributors
- They also have their own value chains
- Then it makes its way to the end customers
- All parts of these chains are included in the value system

Primary Activities

- Inbound logistics
- How we're getting raw inputs that we're gonna need to create
- Operations
- "Factory" where we're gonna build the product
- Outbound logistics
- Shipping our product out towards other businesses or customers
- Marketing and sales

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- Create a lot of value through advertising
- Services
- Supporting these products after they leave the business
- Eg Applecare

Supporting Activities

- The firms infrastructure
- Offices, different departments

- Human resource management
- Need employees, their salaries, benefits
- Product and technology development
- R&D,etc
- Procurement
- Finalization

Is there something I can do better? Can I focus on the activities creating the most value and outsource the ones that don't create as much value?

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Value Chain from a BTM Perspective

Silo = the vertical ones (primary activities)

Strategies for Competitive Advantage

1. Cost leadership strategy

- a. Produce products and/or services at the lowest cost in the industry
- i. Eg Walmarts automatic inventory replenishment system

2. Differentiation strategy

- a. Offering different products, services, or product features than your competitors

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- i. Eg Southwest airlines has differentiated itself as a low cost, short haul express airline, or the opposite of LV

3. Innovation strategy

- a. Introduce new products and services, add new features to existing products and services, or develop new ways to produce them
- i. Eg Uber, and AirBnB

4. Organizational effectiveness strategy

- a. Improve the manner in which a firm executes its internal business processes that it performs these activities more effectively than its rivals. Such improvements increase quality, productivity, and employee and customer satisfaction while decreasing time to market

5. Customer orientation strategy

- a. Concentrate on making customers happy. Web-based systems are particularly effective in this area because they can create a personalized, one-to-one relationship with each customer

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Business-Information Technology Alignment

- IT supports the business
- IT enables the business
- Optimizes costs/benefits ratio

Characteristics of Good Business-IT Alignment

1. Organizations view IT as an engine of innovation that continually transforms the business, often creating new revenue streams
2. Organizations view their internal and external customers and their customer service function as supremely important

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3. Organizations rotate business and IT professionals across departments and job functions
4. Organizations provide overarching goals that are completely clear to each IT and

business employee

5. Organizations ensure that IT employees understand how the company makes (or losses) money

6. Organizations create a vibrant and inclusive company culture

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September 29th 2020 - Business Processes

How can we create our product and/or service?

- Need to look at this from a global point of view

Business Process

- A business process is an ongoing collection of related activities that create a product or a service of value to the organization, its business partners, and/or its customers.

3 Fundamental Elements

1. Inputs:

a. Materials, services and information that flow through and are transformed as a result of process activities

2. Resources:

a. People and equipment that perform process activities

3. Outputs:

a. The product or a service created by the process

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The IPO Model

Information Systems Components with Integrated IPOF

- Constant improvement is also kept in mind
- Business process improvement feedback loop
- Could improve through software that reduces errors
- Could use hardware, automation of processes that were previously man-made

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IPO to IPO to IPO

- We can look at improvements as an ongoing cycle of business improvement
- Inputs of one business could be the output of another business
- Finished steel being the input to a car factory etc
- Businesses are big chains of IPOs
- Something comes in through inbound logistics is the result of another's output

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- By decomposing these activities, we as BTM students can find ways to improve them and develop better alternatives

Flowchart Symbols

- Gateway = decision choice to be made
- There are dotted arrows too

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Cross-Functional Flowchart

- Usually do a macro view and then get more into detail when needed and depending on what you're evaluating

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- More aligned to what our course wants us to do

- Cylinders are data storage units
- The left things are called swimlanes to show whos responsible for what

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- Swim lanes are vertical here

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- More similar to the ones we would create

Business Process Improvement

Excellence in executing business processes is widely recognized as the underlying basis for all significant measures of **competitive performance** in an organization. Which is done in 3 ways:

1. **Slightly improve** by transforming it and applying technology to make it just a little bit better
2. **Completely redesign** a business process in order to completely transform it with the goal of making it a lot better
 - a. Often referred to as business process engineering, business process redesign
3. **Disruption** , radically transform a business process

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- a. Scrap everything and doing something that's completely different that would replace it

- Business typically do slow improvement and don't opt for radical changes
- This is why startups typically disrupt bc they have nothing to lose
- We want to create, maintain and grow our competitive advantage

Consider the following measures:

1. Draw existing business process flowchart
2. Think about how we could improve that (next slides)
 - a. Through brainstorming or R&D
3. Redraw the business process/organizational strategy/marketing etc
 - a. Compare where we are now with where we wanna be tomorrow
 - i. "Future desired state"

Redesigning Business Processes

1. **Customer satisfaction:** the result of optimizing and aligning business processes to fulfill customers needs, wants and desires

- a. Happier customers would buy more which would lead us to making more money

- i. More money = better competitive advantage

2. **Cost reduction:** the result of optimizing operations and supplier processes

- a. Acquisition cost and time taken to receive materials is lower, which would give a CA

- i. Lower cost could lower the price

1. Perceived value would be higher bc it has more value than it costs (theoretical)

- ii. Lower cost but stay at the same price would result in higher profit margins which could be reinvested in R&D

1. Which would allow development of a better future product

- a. Increases perceived value

3. **Cycle and fulfillment time reduction:** the result of optimizing the manufacturing and logistics

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- a. Eg optimizing shipping portion by allowing online ordering through integrating with Fedex and credit card approval
- i. New amazon warehouse in Quebec
- 4. **Quality:** the result of optimizing the design, development and production processes
 - a. Can use robotics in manufacturing process to ensure more consistent output
 - b. Using AI in quality control
- 5. **Differentiation:** the result of optimizing the marketing and innovation processes
 - a. Using social media, influencers, facebook, instagram, tiktok in marketing strategy to make products more desirable
 - b. Eg LV using models as marketing tools and changing designers as well to use for marketing strategy as brand identification
- 6. **Productivity:** the result of optimizing each individuals work processes
 - a. Improving productivity through automation

October 13th 2020 - Week 5 BPMN Diagrams

BPMN = Business Process Management Notation Diagrams

- Map out business processes so that we can understand them
- Then work on improving them
- Then map future desired business process
- And figure out a plan on how to get from where we are to where we want to be

BPM With Activity Diagrams

- Business processes consist of a number of activities
- Activity diagrams depict the sequence of these activities
- Diagrams are abstract and describe processes in general
- They model behaviour independent of objects
- Can be used for any type of process

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- Decision nodes typically have one arrow going in and two going out bc they are yes or no type of questions
- So with 2 possible outcomes there are different measures to be taken

Elements of an Activity Diagram

- **Actions and Activities**
 - Something performed for some specific business reason
 - Named with a verb or noun (eg get patient information)
 - Activities can be further subdivided; actions cannot
- **Object nodes:** represent the flow of information from one activity to another
- **Control flows:** model execution paths
- **Object flows:** model the flow of objects

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- **Control nodes:** 7 types

Control Nodes

- **Initial node:** the beginning of the set of actions/activities
- **Final-activity node:** stops all actions/activities
- **Final-flow node:** stops one execution path but allows others to continue
- **Decision node:** represents a test to determine which path to use to continue (based on a guard condition)
- **Merge node:** rejoins mutually exclusive execution paths
- **Fork node:** separates a single execution path into one or more parallel paths

- **Join node:** rejoins parallel execution paths

Activity Diagram Symbols

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Connecting Objects

- Helps connect the flow objects
- Three types:
 - Sequence flow
 - Depicts the order of execution of the flow objects
 - Message flow
 - Depicts the flow of messages between two process participants
 - Associations
 - Associates data, text and artifacts with flow objects
 - Used to show inputs and outputs of activities

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Sample Activity Diagram

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Swim Lanes

- Used to assign responsibility to objects or individuals who actually perform the activity
- Represents a separation of roles among objects
- Can be drawn horizontally or vertically

Guidelines for Activity Diagrams

1. Set

- a. Set the scope of activity being modeled

2. Identify

- a. Identify the activities; connect them with flows

3. Identify

- a. Identify any decisions that must be made

4. Identify

- a. Identify potential parallelism in the process
 - i. Tasks that could be done at the same time

5. Draw

- a. Draw the activity diagram

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Creating an Activity Diagram

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Views of BPMN

- **Internal business processes**
 - Focus on the point of view of a single business organization
 - Defines activities that are not visible to the public
 - Can be developed in parallel with other business elements

● **Collaborative B2B Processes**

- Interaction between two or more business entities only
- Defines interactions that are public for each participant
- Shows less internal details of the entities

When to use BPMN

- UML Activity Diagrams similar to BPMN
- Different approaches:
 - UML: system view, object-oriented approach (universal markup language)
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- BPMN: customer view, process-oriented approach
- BPMN geared towards business analysts:
 - BPMN constructs are simplified
 - UML notation too bloated

Continuation of Enterprise Systems (Week 5.5)

What are the fundamental ways of achieving competitive advantage?

- **Changing the product:**
 - By introducing new products or services or enhancing current products or services
- **Business processes:**
 - Organizations use technology to help lock in customers, reduce costs, and create entry barriers for competitors in the market

Can information systems affect competitive advantage?

Yes, **obviously**

- By making the primary and support activities in an organization more productive than those of competitors
 - Porter's value chain
 - How can we improve, modify and eliminate steps
- Increased productivity is realized when business processes with the organization become more effective and more efficient
 - How well we meet our goals
 - Improving our ratio of inputs to outputs, we are more efficient

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Business Functions and Functional Activities

Value Chain Activities

- **Primary Activities**
 - Relate directly to organizations customers and products
 - The activities that create value
- Marketing and sales
- Inbound logistics
- Operations and manufacturing
- Outbound logistics
- Service and support
- **Facilitated by support activities**
 - Human resource
 - Accounting and infrastructure
 - Procurement

- Technology activities

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Functional Silos and Cross-Functional Systems

- Functional silos: systems designed to work independently of one another
- Functional systems are inter-related in reality
- Purchasing influences inventory, which influences production, which influences customer satisfaction, which influences future sales
- Decisions that are appropriate for only single function may be inefficient for an entire business process
- Purchasing affects inventory, inventory affects customer satisfaction, customer satisfaction affects marketing etc

Separate Functional Systems

- If you have the same system in all departments spring all the same data, it's highly inefficient and could lead to errors in data and errors in the decision making process

Typical Functional Systems

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Function Examples of Information Systems

Marketing and sales Product management

Lead tracking

Sales forecasting

Customer management

Operations Order entry

Order management

Inventory management

Customer service

Although these systems are independent they are interconnected because we need to know all this information

Why are Functional Systems Changing?

Functional systems provide tremendous benefits, but are limited because they operate in isolation

- Data duplication results from each application having own database
- Potential lack of data integrity
- Business processes disjointed across functions
- Produces lack of integrated enterprise information
- Making it difficult for managers to make "big picture" decisions
- Limited information available at any one source
- Inefficient decisions based on limited knowledge
- Leading to bad decisions and high risk increase
- Increased costs to organization

Integrated, Cross-Functional Systems

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Manufacturing Inventory

Planning scheduling

Manufacturing operations

Human resources Payroll and compensation

Recruiting

Assessment

Development and training

Human resources planning

Accounting and finance

General ledger

Financial reporting

Accounts receivable

Accounts payable

Cost accounting

Budgeting

Cash management

Treasury management

- Cross-department systems operate across departmental boundaries
- Transition from functional systems to integrated cross-functional systems is difficult
- Integrated processing needs many departments to coordinate activities
- Interorganizational systems are cross-functional systems used by two or more related companies
- Most organizations today have a mixture of functional and integrated systems
- Legacy systems are used as silos in integration with newer systems

Major Problems of Isolated Functional Systems

- Data duplication, data inconsistency
- Disjointed processes
- Limited information and lack of integrated information
- This therefore makes it difficult to create an integrated view
- Making it even more difficult to establish value
- Isolated decisions lead to inefficient overall activities
- Increased expense

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How can business processes be improved?

- Business processes are supported by information systems
- IT enables firms to innovate and make significant change
- Besides technology, business processes can also be improved by:
 - Adding resources, such as more workers
 - Adding increased specialization
 - changing/eliminating unproductive activities

Using Technology to Improve Business Processes

- Using IT to improve business process requires understanding of where improvements are possible
- More efficient business processes integrate the activities of all departments involved in a value chain

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EAI and ERP

● **Enterprise Application Integration (EAI)**

- An approach to combining functional systems, which uses layers of software as a bridge to connect different functional systems together

● **Enterprise Resource Planning (ERP)**

- A second approach to combining functional systems
- Main design principle - one central database is combined with a set of standard processes built on top of the database to ensure integration

between functional areas

Enterprise Application Integration (EAI)

- With enterprise application integration, the data stays in the functional system.
- The manager accesses the data through the EAI interface

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- The manager sees a single database
- The EAI interface sends data to the EAI server
- The functional systems still exist separately and store actual data

Enterprise Resource Planning

- With enterprise resource planning, there is a single central database
- The manager accesses data through this database
- People in the functional areas use ERP to send and receive data directly from the central database
- No functional systems exist
- They were replaced by the ERP modules

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What are the challenges of implementing business process changes?

- Process design projects are expensive and difficult; three reasons for this are:
 - There is a lot of detailed work to be done to determine what to change and make an effective decision
 - Hard to estimate the business value that will emerge from business process changes
 - May take a long time
 - Very expensive and outcomes are uncertain

What is the importance of industry standard processes?

- Many early business process design projects failed because they were tailor-made
- Software vendors designed integrated applications, with built-in industry standard processes
 - Integrate activities across departments
 - Save costs of new process design
 - Examples: Oracle, Salesforce.com, Microsoft or SAP
- Problems:
 - Industry standard processes may be very different from existing processes in the organization
 - May require the organization to change substantially

What are ERP systems?

- Enterprise Resource Planning (ERP)
 - Support all the primary business processes as well as the human resource and accounting support processes
 - Enterprise-wide systems that integrate sales, order, inventory, manufacturing, and customer service activities
 - ERP systems provide software, pre-designed databases, procedures, and job descriptions for organization-wide process integration

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Characteristics of ERP

- Provides cross-functional, process view of the organization
- Has a formal approach based on formal business models

- Offers large benefits but is difficult, fraught with challenges, and can be slow to implement
- Is often VERY expensive

What are CRM systems?

- Cross-functional systems are developed to overcome problems in functional silos
- Customer Relationship Management (CRM) systems:
 - Support the business processes of attracting, selling, managing, delivering and supporting customers
 - Direct value chain activities that involve the customer
 - Integrates four phases of the customer life cycle: marketing, customer acquisition, relationship management, and loss/churn
 - All customer data stored in single database

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The Customer Life Cycle

Purpose of Relationship Management

- To maximise the value of the existing customer
- Two types of application for RM applications
 - Sales Management applications
 - Support sales to existing customers
 - Ensures that sales management has sufficient information to prioritize and allocate sales time efforts
 - Integrated CRM applications
 - Store data in a single database
 - CRM processes can be linked to one another

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CRM Components

Integrated CRM Applications

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What are SCM systems?

- **Supply chain management (SCM)** systems are interorganizational; systems that enable companies to efficiently handle the flow of goods from suppliers to customers
- A supply chain is a network of organizations and facilities that transforms raw materials into products delivered to customers
 - Involves customers, retailers, distributors, manufacturers, suppliers, transportation companies, warehouses, inventories, and some means for transmitting messages and information among the organizations involved

Supply Chain Relationships

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Supply Chain Example

Week 6 - Enterprise Systems Part 2

Enterprise Systems (ES)

- Complex and powerful information systems
- SAP Enterprise Resource Planning (ERP) system is the worlds most popular

Architecture of Enterprise Systems

- Client-server

- Service-oriented

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3 Layers of the Client-Server Architecture

- Presentation layer:
 - At the client's side (eg using windows)
- Application layer:
 - Has application server (eg SAP server)
- Data layer:
 - Database server

Service-Oriented Architecture

- Web services
 - Used to expose ES (and other system) functionality
 - Standard interface - input and output
- Composite applications

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- Connect multiple applications via Web services
- Build new capabilities without changing the underlying applications
- As having multiple components that are all interconnected
- Each block has its own function

Enterprise Resource Planning Systems

- Focus primary on internal operations of an organization
- Integrate functional and cross-functional processes
- SAP is a fully integrated, global ERP system
- Supports multiple languages and currencies

The SAP ERP Solution Map

SAP ERP Modules

- Production Planning (PP)
- Material Management (MM)
- Sales and Distribution (SD)
- Plant Maintenance (PM)
- Project Systems (PS)
- Quality Management (QM)

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- Financial Accounting (FI)
- Management Accounting Controlling (CO)
- Human Resources (HR)
- Business Intelligence (BI)

Enterprise Systems Application Suite

- Enterprise Resource Planning (ERP)
- Supply Chain Management (SCM)
- Supplier Relationship Management (SRM)
- Product Lifecycle Management (PLM)

If we are working with other parties we are going to have interconnected ERPs through the SRMs

Applications Platforms

- Enterprise Operating System

- SAP NetWeaver introduced in 2003
- Integral part of SAP ERP and SAP Business Suite
- Toolset for composite application and plug-in software
- Integrates non-SAP applications

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Data in an Enterprise System

- Organizational data (levels, elements)
- Master data
- Transaction data
- Association with process steps

Organizational Data

- Defines the structure of the legal enterprise in terms of legal or business purposes.

Examples include:

- Legal; entities
- Plants
- Storage areas
- Sales organizations
- Profit centers
- Data rarely changes

Organizational Level - Client

- Client:
- Highest organizational level
- Represents the enterprise; comprised of many companies

Organizational Level - Company Code

- Central organizational element in financial accounting
- Books are maintained at this level for legal reporting
- Identifies legal entities in an enterprise (Client)
- Legally independent from other companies in the enterprise
- Clients can have multiple company codes
- Company code must belong to only one client

Organizational Level - Plant

- Performs multiple functions
- Used by many processes

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- Represents factory, warehouse, office, distribution center, etc

Organizational Data

Master Data

Long-term data that typically represent entities associated with various processes:

- Customer
- Vendor
- Material

Typically includes:

- General data (across company codes)
- Financial data (CC specific)
- Area-specific data (Sales, Purchasing, Plant)

Material Master

- Material master data is used in numerous processes

☐ Procurement

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☐ Fulfillment

☐ Production

☐ Material planning

☐ Asset management

☐ Project systems

☐ Lifecycle data management

☒ Data is grouped based on:

☐ Process

☐ Material type

☐ Organization element

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Material Types

1. Raw materials (ROH)

☐ Purchased

☐ Not sold

☐ Used in production purchasing and production related views

☐ No sales-related view

2. Semi-finished goods (HALB)

☐ Produced other materials (ROH, HALB)

☐ Used in the production of other materials (HALB, FERT)

☐ Not purchased or sold

3. Finished goods (FERT)

☐ Produced using other materials (ROH, HALB)

☐ Sold to customers

4. Trading good (HAWA)

☐ Purchased and resold without additional processing

5. Numerous other types

Organizational Level

☒ Same material can be used differently by different organizational levels

☐ Different company codes

☒ HALB in one, FERT in another

☐ Different plants

☒ Only exports or imports in specified plants, not all

☐ Different sales-related organizational elements

☒ Wholesale vs retail

Week 7: Databases

Difficulties in Managing Data

☒ Amount of data increases exponentially over time

☒ Data is scattered throughout organizations

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☒ Data obtained from multiple internal and external sources

☒ Data degrades over time

☒ Data is subject to media data rot

☒ Data security, quality, and integrity are critical, yet easily jeopardized

- Information systems that do not communicate with each other can result in inconsistent data
- Federal regulations require corporations to account for how their data is managed

Data Governance

- Data Governance is an approach to managing information across an entire organization
- Uses Master Data Management (a subset of data governance)
- Provides control over:
 - Master Data (semi-permanent or core data) and
 - Transaction Data (business activities)

Master Data Example

John Stevens registers for Introduction to Management Information Systems (ISMN 3140) from 10 AM until 11 AM on Mondays and Wednesdays in Room 41 Smith Hall, taught by Professor Rainer.

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The Database Approach

- DBMS = Database Management System
- Database is arranged so that one set of software programs - the DBMS - provides all users with access to all data
- Database minimise the following problems:
 - **Data redundancy:** the same data stored in many places
- **Data isolation:** applications cannot access data associated with other application
- **Data inconsistency:** various copies of the data do not agree (not updated/upgrades)

Database Management Systems (DBMS) maximize the following:

- **Data security:** databases must have extremely high security measures in place to deter mistakes and attacks once data is stored in one place
- **Data integrity:** data must meet certain constraints, such as no alphabetic characters in a Social Insurance Number field
- **Data independence:** applications and data are not linked to each other (kept separate or independent by the DBMS that controls access), so that all applications are able to access the same data

Database Management System Example

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Data Hierarchy

- **Bit:** (binary digit) represents the smallest unit of data a computer can process
- **Byte:** represents a single character, often composed of eight bits (eg 01101010 which represents lowercase j)
- **Field:** a logical grouping of related characters
- **Record:** a logical grouping of related fields
- **File (or table):** a logical grouping of related records
- **Database:** a logical grouping of related files

Database Management Systems

- Database management system creates and manages a database
- Relational database model is based on concept of 2 dimensional tables

Designing the Database

Data model is a diagram that represents the entities in the database and their relationships

- **Entity:** is a person, place, thing, or event about which an organization maintains information, its something of importance that you want to be tracking. A record describes an entity

- **Instance:** is one specific, unique representation of the entity

- **Attribute:** is a characteristic or quality of a particular entity

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- **Primary key:** is a field that uniquely identifies a record. Note that every record *MUST* have a primary key

- Eg Student ID

- **Secondary keys:** are other identifying fields that typically do not identify the file with complete accuracy

- **Foreign key fields:** are used to uniquely identify a row of another table that is linked to the current table

Activity Example

An art museum owns a large volume of works of art. Each work of art is described by an item code (identifier), title, type, and size; size is further composed of height, width, and weight. A work of art is created by an artist, but the artist of some works is unknown. An artist is described by an artist ID (identifier), name, date of birth, and date of death (which is null for still living artists). Only data about artists for works currently owned by the museum are kept in the database. At any point in time, a work of art is either on display at the museum, held in storage, away from the museum as part of a traveling show, or on loan to another gallery. If on display at the museum, a work of art is also described by its location within the museum. A traveling show is described by a show ID (identifier), the city in which the show is currently appearing, and the start and end dates of the show. Many of the museum works may be part of a given show, and only active shows with at least one museum work of art need be represented in the database. Finally, another gallery is described by a gallery ID (identifier), name, and city. The museum wants to retain a complete history of loans of a work of art to other galleries, and each time a work is loaned the museum wants to know the date the work is loaned and the date it was returned.

Yellow = entity

Orange = attribute

Pink = Primary Key

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When you have a relationship between 2 entities you need a foreign key on one side and a foreign key on the other side

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Data Design for Database and File-Based Systems

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Columns are attributes here

Entities are the rows

Big Data

- Data is being collected at an increasingly rapid pace from many sources

- New types of data are being collected

- Organizations and individuals must process this data

- Worldwide, IDS reports that data is increasing by 50% per year

- BIG DATA = data so large and complex it cannot be managed by traditional systems

Characteristics of Big Data

1. **Volume:** computer-generated from many sources

2. **Velocity:** flows rapidly to/from within the organization

3. **Variety:** in addition to numbers and text, it includes images, sound, web based content and others (heterogeneous)

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Issues with Big Data

- Sources can include:

- Untrusted sources

- Eg social media, call centers

- Data could be “dirty”

- Eg inaccurate, incomplete, incorrect, duplicate or erroneous

- Big data changes since quality issues can arise during collection that are temporary or permanent

Managing Big Data

- Deciding what needs to be done is the most important task - what is the information gap or problem? For example:

- Sport business trends more rapidly and accurately

- Prevent the spread of disease

- Track crime

- Then, the organization needs to move from traditional processing to Big Data

Processing:

- Integrate information silos into a database environment

- Develop data warehouses to access multiple databases or long term data

- Query the data warehouse using business intelligence

Putting Big Data to Use

- **Making data available:** using public data or meta-analysis

- **Enabling organizations to conduct experiments:**

- Eg using multiple views of a website to test consumer response

- **Micro Segmenting customers:** dividing customers into smaller groups to provide tailored services

- Creating new business models

- Being able to analyze more data

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Big Data in Functional Area of the Organization

- **Human resources:** discovering health care trends to lower health care costs

- **Product development:** text mining the Internet to explore customer preferences on a 3-blink turn signal

- **Operations:** reducing fuel consumption on deliveries and optimizing delivery routes

- **Marketing:** creation of 1,500 tailored marketing messages by integrating data from internal systems with social media

- **Government operations:** water management systems based on water control sensors

Data Warehouses and Data Marts

Comparison of data warehouses and databases:

Data Warehouses and Data Marts: Characteristics

- Organized by business dimension or subject

- Use online analytical processing

- Integrated

- Time variant
- Nonvolatile

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Databases Data warehouses

Data content is from current operations, normally updated in real time, with high volumes

Data content is from past and current data that is updated at regular intervals (e.g. hourly, daily)

Searching a database that is part of operations for specific queries could slow down operations (with many searches)

Searching a data warehouse can be done with a long turnaround time or even overnight

Content changes frequently due to transaction processing and changes to master data

Content is read-only, data cannot be changed only added to

Organization is optimized for online processing of single transactions

Organization is to support business intelligence applications, such as complex manipulations of arrays

- Multidimensional

The Environment for Data Warehouses and Data Marts Includes

- Source systems that provide data to the data warehouse or data mart
- Data-integration technology and processes that prepare the data for use
- Different architectures for storing data in an organization's data warehouse or data marts
- Different tools and applications for the variety of users
- Metadata, data quality and governance to ensure that the data warehouse or data mart meets its purpose

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Week 8: Databases Part 2

Relational Databases

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Data Cube

Equivalence between Relational and Multidimensional Databases

- They are different representations of the same idea
- Would correspond with different rows and columns

Data Integration

ETL: extract, transform, load

- To extract data from source systems, transform them and load them into a data mart or warehouse
- Can be performed by hand-written code (eg SQL queries) or by commercial data

integration software

- Can be transformed to make them more useful

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Storing the Data

- The most common architecture is one central enterprise data warehouse, without data marts, called *"a single version of the truth"*
- Independent data marts, which store data for a single or a few applications, such as in marketing or finance
- Hub and spoke stores data in a central data warehouse while simultaneously maintaining dependent data marts that obtain their data from the central repository
- This helps to maintain a single view of the data since it is centrally organized
- **Metadata:** is data about data
- **Data Quality:** the quality of the data in the warehouse must be adequate to satisfy users' needs
- Governance requires the people, committees, and processes be in place to plan and control the development and use of the data warehouse
- **Users:** there are a large number of potential BI users, including IT developers; front-line workers, analysts, information workers, managers and executives, and suppliers, customers and regulators

Knowledge Management

- **Knowledge management (KM):** a process that helps organizations manipulate important knowledge that is part of the organization's memory
- **Knowledge:** information that is contextual, relevant, and useful, developed with the assistance of expertise, also known as **Intellectual capital (or intellectual assets)**
- **Explicit knowledge:** objective, rational, technical knowledge that has been documented
- Examples: policies, procedural guides, reports, products, strategies, goals, core competencies
- **Tacit knowledge:** cumulative store of subjective or experiential learning
- Examples: experiences, insights, expertise, know-how, trade secrets, understanding, skill sets, and learning

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- Knowledge management systems use modern information technologies to systematize, enhance and expedite knowledge management, with the goal to make the most productive use of knowledge
- Best practices (effective and efficient ways of doing things) are an example of knowledge that can be managed with the assistance of a KMS

Knowledge Management System Cycle

Fundamentals of Relational Database Operations

- **Query Languages:** search for information in databases for data warehouses
- **Normalization:** optimize the tables in a relational database
- **Joins:** link relational database tables with common attributes

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Query Languages: SQL (Structured Query Language)

Typical keywords include:

- **SELECT** - what to locate
- **FROM** - specify the source files

- WHERE - provides conditions for the search, like an “if” statement
- For example, these statements could be combined as follows:
 - SELECT Student_Name
 - FROM Student_Database
 - WHERE GPA>=3.40 and GPA<3.60

Query Languages: QBE (Query by Example)

- Uses a form (template) to provide a sample or description of the desired information
- Drag and drop features of DBMS such as Microsoft Access enable easy completion of QBE forms

Entity-Relationship (E-R) Modeling

- Database designers plan the database design in a process called entity relationship modeling
- ER diagrams consists of entities, attributes and relationships organized using business rules
- Business rules describe how the organization uses its data to run its operations
- Entities are shown in **rectangles** , with relationships shown on the lines between them

E-R Modeling Terms

- Degree of relationship: how many linkages?
 - **Unary**: single entity
 - **Binary**: two related entities
 - **Ternary**: three related entities
- Relationship classifications:
 - **One-to-one (1:1)**: eg student : parking permit
 - **One-to-many (1:M)**: eg professor : class
 - **Many-to-many (M:M)**: eg students : classes
- Not gonna use this in the course, instead convert to many 1:M relationships

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- **Cardinality**: the number of times a single record/instance of one entity can be associated with a single record/instance of another entity:

- **Mandatory single**: eg inventory quantity on hand with its sale price
 - Minimum of 1, maximum of 1
- **Optional single**: eg employee wage rate with pay cheque (employees may not be paid if they are on vacation or leave)
 - Minimum of 0, max of 1
- **Mandatory many**: eg department details with employee details
 - Minimum of 1 and no max
- **Optional many**: customer details with customer sales details/invoices (not all customers purchase every month)
 - Minimum of 0, max of many

Cardinality Symbols

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- Mandatory single:
 - Bars mean minimum of 1, maximum of 1
- Optional single:

- The circle means min 0 and the bar means max 1
- Mandatory many:
- Many is the max (**crowsfoot** closest to the entity), the bar is 1
- Optional many:
- Can have none (circle), or many (crowsfoot)

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One-to-one Relationship

One-to-many Relationship

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Many-to-many Relationship

- Since we don't do that in this course, we convert it to two separate relationships with a **bridge table** or a **transitional table**
- This breaks up the many to many
- Student ID number connects to registration
- Which has Class ID number which connects to the class
- We don't use diamond shapes in our diagrams

Normalization

- A method for analyzing and reducing a relational database to its most streamlined form
- Purpose is to provide minimum redundancy (minimize duplicated attributes)
- Focus is to reduce non-key attributes
- Improves processing efficiency of the database
- Functional dependencies express how attributes are associated (eg every pizza order needs a date) and need to be retained during normalization

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Week 9: Business Analytics

- Developing actionable decisions or recommendations for actions based on data
- Examine data with tools and techniques
- Formulates descriptive, predictive, and prescriptive models
- Communicates results to decision makers

Business Intelligence (BI)

- Applications, technologies and processes
- Used for gathering, storing, accessing and analyzing data
- To help make better decisions

Why do we care?

- As managers, we need to make decisions

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- We need tools to help us

Management

- **Management:** a process by which an organization achieves its goals through the use of resources
- People
- Money
- Materials
- Information

Productivity

- **Efficiency:** ratio between the inputs and outputs, performing or functioning in the

best possible manner with the least waste of time and effort

● **Effectiveness:** the degree to which something is successful in producing a desired result

Decision

● **Decision:** a choice among two or more alternatives that individuals and groups make

● Decisions are diverse and are made continuously

● Decision making is a systematic process

The Managers Job and Decision Making

● Management

● Productivity

● Three Basic Roles of Managers

● Decision

● Four Phases of Decision Making

Three Basic Roles of Managers

1. **Interpersonal roles:** managing people

2. **Informational roles:** how we gather and manage information

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3. **Decisional roles:** based on the information we have, we make a decision

The Process and Phases in Decision Making

Start with the intelligence phase

Computerized Decision Analysis Framework

● Using tools to make decisions

● This is still embryonic and a work in progress

● Machine intelligence, AI etc

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Managerial Decisions Categories

1. **Operational Control:** executing specific tasks efficiently and effectively

2. **Management Control:** acquiring and using resources efficiently in accomplishing organizational goals

3. **Strategic Planning:** the long-range goals and policies for growth and resource allocation

Decision Support Framework

● **Structured decision:** have specific goals and numbers in mind and make decisions based on acquiring so

○ Can create an algorithm that creates the optimal decision

○ Can use a model, statistics, algorithms, formulas to make a choice

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■ E.g. a project requires x% of the budget, the max budget % in the algorithm is 10%, any project with less than 10% would be automatically approved, any project with more would be rejected

● **Semistructured:** using technology to evaluate options and choose the most optimal one

○ E.g choosing to invest in a stock

● **Unstructured decision:** so many variables, it makes it impossible to determine a formula/algorithm a process

○ Based on gut feeling

Business Analytics Process

- ETL is very important here
 - Getting all the data from all the different silos and systems and we want to extract this data and get it ready to a different format so that we can load it into a data repository (data warehouse)
 - So that we can store a copy of our operational data so that we can use this for business analytics/business intelligence
 - We can also create specialized subsets of the data warehouse due to its size (like Costco)
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- So that it's easier to use for all departments
 - Eg one for marketing, one for finance etc in data marts
 - Using this data in the data marts/warehouse, we can use different tools and techniques
 - We can use data mining to try to find the information we find valuable
 - Eg sales data, new business opportunities
 - **DSS:** using historical data in the data warehouse to help us make decisions
 - We can also use AI, Machine learning, Deep learning to use the information to help us make decisions
 - Once we find this data we use statistical models to evaluate it and help us understand our current position
 - How effective and efficient we are and how we can improve managing our business
 - Based on this we can create:
 - **Descriptive models:** models that describe what we're doing
 - **Predictive models:** models that help us understand how things will be in the future based on past data
 - **Prescriptive models:** models that help us figure out how we should be doing things and how we should improve
 - We then present this information in a format that is easily understandable to humans through reports and dashboards
- Bloomberg stock information dashboard

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Types of Dashboard Capabilities

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Week 10: eBusiness

Definitions and Concepts

- **E-commerce (EC):** the process of buying, selling, transferring or exchanging products, services or information via computer networks, including the Internet
- **E-business:** in addition to EC, e-business also refers to servicing customers, collaborating with business partners, and performing electronic transactions within an organization
- **Pure vs Partial Electronic Commerce** depends on the degree of digitization involved.
 - Considered that the product, process or delivery agent can be physical or digital

- **Brick-and-mortar organizations:** purely physical, old school
- **Virtual organizations:** engaged only in ED (also called “pure play”)
- **Click-and-mortar (also called “clicks and bricks” organizations):** conduct some e-commerce activities, yet their business is primarily done in the physical world
 - Eg “partial EC”
- **Other combinations:** that include a mix of digital and physical dimensions are considered **partial EC**

Brick-and-mortar, Partial EC, Pure Play EC Examples

- **Brick-and-mortar:** buy books at university bookstore in person
- **Partial EC:** use internet to order physical book from Amazon
- **Pure EC:** order and download e-book from Amazon

Types of E-Commerce

- **Business-to-Consumer (B2C):** business sells to consumers
- **Business-to-Business (B2B):** business sells to business
- **Consumer-to-Consumer (C2C):** consumers sell to consumers
 - Eg Kijiji
- **Business-to-Employee (B2E):** business interacts with employees
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 - Eg pays payroll
- **Government-to-Citizen (G2C) or Government-to-Business (G2B):** government interacts with consumers or business (eg collects taxes)
- **Mobile Commerce (m-commerce):** any of the e-commerce types handled using mobile system
- **Platform economy:** when theres consumer-to-consumer interaction mediated via a platform such as AirBnB or Uber

e-Commerce Business Models

- **On-line direct marketing:** selling my products online through a business front to customers
- **Electronic tendering system:** B2B reverse auction that involves requesting quotes from suppliers
 - through bidding like on ebay
- **Name-your-own-price:** using an intermediary, customers decide how much they are willing to pay
 - propose a price and buy (eg poshmark)
- **Find-the-best-price:** intermediaries search for and provide the best price for what customers want
- **Affiliate marketing:** logos or banners are placed on partner sites; if purchases are made then the advertiser pays a commission to the affiliate
 - using a website and selling through them (eg through advertising)
- **Viral marketing:** using social media or email marketing (purpose is to create buzz) relying on people to tell their friends electronically about products
- **Group purchasing:** bulk buying (eg Groupon)
- **Online auctions:** products are auctioned online
- **Product customization:** online self-configuration of products that are individually produced
- **Electronic marketplaces and exchanges:** online private (one seller) or public (many sellers) marketplaces attract many buyers

● **Omnichannel:** multiple different business models for an organization so that we can create a relationship with customers through social media/e-commerce/ in store experience etc..

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○ United integrated marketing ecosystem which pursues relationship with customer

■ Eg apple, can buy online, in their online store, in store etc, getting in store support, online support etc

● **Bartering online:** exchanges or sales of products without the exchange of cash using an intermediary

○ Eg auction using “points”

● **Deep discounters:** online direct sales at low prices for special promotions or “fire sales”

○ Eg end of lines

● **Membership:** only members can use the services, which could be products or services. Membership could be free or paid

Major E-Commerce Mechanisms

● **Electronic catalogues** display products or services available for sale at a fixed price

● **Online auctions** - both types can feature thousands of products or quotes

○ **Forward auctions:** try to obtain the highest amount for a product or service placed in sale by a buyer

■ Eg ebay

○ **Reverse auctions:** the buyer tries to obtain the lowest price from a seller requesting a quote

■ Eg merx

Electronic Payment Mechanisms

● Electronic cheques

● Electronic cards

○ Electronic credit cards

○ Purchasing cards

○ Stored-value money cards

○ Smart cards

● Digital wallets

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How Credit and E-Credit Cards Work

Benefits of E-Commerce

● **Benefits to organizations:**

○ Makes national and international markets more accessible

○ Lowering costs of processing, distributing and retrieving information

● **Benefits to customers:**

○ Access a vast number of products and services around the clock (24/7 365 days a year)

● **Benefit to society:**

○ Ability to easily and conveniently deliver information, services and products to people in cities, rural areas, and developing countries

Limitations of E-Commerce

● **Technological limitations include:**

- Lack of universally accepted security standards
- Insufficient telecommunications bandwidth in some areas

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- Expensive accessibility to the web in some countries or regions

● **Non-technological limitations are perceptions that:**

- E-commerce is insecure
- There are unresolved legal issues
- It lacks a critical mass of sellers and buyers

Business-to-consumer (B2C) E-Commerce

- Smaller than B2B but more complex
- Many buyers make millions of diverse transactions daily
- Companies need to process many (potentially small) order quickly and efficiently
- B2B topics:
 - Electronic storefronts and malls
 - Online service industries
 - Advertising models
 - Issues in e-tailing

Electronic Storefronts and Malls (use of e-tailing)

- **Electronic storefronts (e-storefronts):** have a unique URL for a single organization; they can be extensions of the physical stores
- **Electronic malls (e-malls):** have many individual shops also grouped under the same URL. There are two types:
 - Referral malls: which transfer you to the website of the shop that is part of the mall
 - Purchasing malls provide a common shopping cart for multiple vendors
- Eg amazon

Online Service Industries

- Online service involves customers accessing services via the Web
- Intermediaries or middlemen provide information and/or provide value-added services
- When the functions of these intermediaries is automated or eliminated, this process is called **disintermediation**

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- Cyberbanking
- Online securities trading
- Online job market
- Travel services
- Online advertising

Online Advertising Methods

- Advertising is an attempt to disseminate information in order to influence a buyer-seller transaction
- Internet advertising redefines the advertising process, making it media-rich, dynamic, and interactive.
- **Banners** are simply electronic billboards. When customers click on a banner ad, they are transferred to the vendor's homepage.
- **Pop-up ad** appears in front of the current browser window.
- **Pop-under ad** appears underneath the active window.

- **Spamming** is the indiscriminate distribution of electronic ads without the permission of the receiver.
- **Permission marketing** asks consumers to give their permission to voluntarily accept online advertising and e-mail.
- **Viral marketing** refers to online “word-of-mouth” marketing.

Problems in E-tailing

- **Channel conflict:** occurs when clicks-and-mortar companies may face a conflict with their regular distributors when they sell directly to customer on-line
- **Showrooming:** shoppers visit a bricks-and-mortar store to look at products in person, then research the product online, often buying it elsewhere
- **Order fulfillment:** involves finding the product to be shipped; packaging the product; arrange for speedy delivery to the customer; and handle the return of unwanted or defective

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Solving the Problems

- **Multichanneling:** a process many companies use to integrate their on-line and off-line (also known as omni-channeling)

Business-to-Business (B2B)

- In B2B e-commerce, the buyers and sellers are organizations. There are:
 - Sell-side marketplaces
 - Buy-side marketplaces
 - Electronic exchanges (they handle both)

B2B Sell-side Marketplace

- In the **sell-side marketplace**, organizations sell their products or services to other organizations electronically with their own website and/or from a third party website
- **Key mechanisms:** electronic catalogues and forward auctions

B2B Buy-side Marketplace

- The **buy-side marketplace** is a model in which organizations attempt to buy needed products or services from other organizations electronically
- **Key mechanism:** reverse auctions
- Buy-side supporting processes:
 - E-procurement
 - Group purchasing

Electronic Exchanges

- Private exchanges have one buyer and many sellers
- E-marketplaces, called **public exchanges** or just **exchanges**, are independently owned by third party and connect sellers and many buyers
- There are 3 basic types of public exchanges:
 - **Vertical Exchanges** connects buyers and sellers in a given industry
 - **Horizontal Exchanges** connect buyer and sellers across many industries

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- **Functional Exchanges** provide needed services such as temporary help or extra office space on an “as needed” basis

Ethical and Legal Issues

Ethical Issues

- Privacy

- Tracking
- Use of the internet for illegal or unethical purposes

Legal and Ethical Issues Specific to E-Commerce

- **Fraud on the Internet:** fraudulent activity
 - Eg stocks, auctions, investments, business opportunities
 - **Domain Names** are considered to be legal when the person or business who owns the name has operated a legitimate business under that name for some period of time
 - **Cybersquatting:** is the practice of registering or using domain names for the purpose of profiting from the goodwill or the trademark to someone else
 - **Domain Tasting:** is a practice of registrants using the five-day “grace period” at the beginning of a domain registration to profit from pay-per-click advertising
 - **Taxes and Other Fees** require appropriate collection from website vendors
 - **Web Copyright protecting** intellectual property in e-commerce and enforcing copyright laws is extremely difficult because it involves hundreds of millions of people who have access to billions of web pages in about 200 countries
- To procure various kinds of equipment each department deals with many vendors
A vendor typically supplies equipment to many departments
We are required to store the name and address of each vendor and the date of the last meeting between a department and a vendor
This is paragraph 3 and use this for the flowchart
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Week 10: Social Computing (Part 2)

Web 2.0

Web 2.0: is a loose collection of information technologies and applications, plus the websites that use them, which:

- Encourage user participation, social interaction and collaboration
- Facilitate information sharing, user-centered design and collaboration
- Harness collective intelligence
- Deliver functionality as services and feature remixable applications and data

Technologies and applications

1. **Tagging:** a key word that describes a piece of information, it allows users to place information in multiple, overlapping associations rather than in rigid categories.

- For example, a photo of a car might be tagged with “Corvette,” “sports car,” and “Chevrolet.”
- Tagging is the basis of **folksonomies**, which are user-generated classifications that use tags to categorize and retrieve web pages, photos, videos, and other web content.

○ **Geotagging:** involves tagging information on maps

2. **Really Simple Syndication (RSS):** is a Web 2.0 feature that allows you to receive the information you want (customized information), when you want it, without having to surf thousands of websites.

- RSS allows anyone to syndicate (publish) his or her blog, or any other content, to anyone who has an interest in subscribing to it.
- When changes to the content are made, subscribers receive a notification of the changes and an idea of what the new content contains.
- Subscribers can then click on a link that will take them to the full text of the

new content.

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Blogs

3. **Blogs:** is a personal website, open to the public, in which the site creator expresses his or her feelings or opinions via a series of chronological entries.

4. **Blogger:** people who create and maintain blogs—write stories, convey news, and provide links to other articles and websites that are of interest to them.

5. **Blogosphere:** term for the millions of blogs on the web.

Companies use blogs for:

- Input into their processes and products
- Marketing purposes
- Listen to consumers who express views on the companies' products
- Provide information for their clients. For example, IT's About Business 9.1 explains how Brian Krebs tells his customers about recent viruses and other security issues.

- Detect false rumours

- Gauge marketing push or popularity of new products

6. **Microblogs:** is a form of blogging that allows users to write short messages (or capture an image or embedded video) and publish them.

- Messages are submitted by text messaging, instant messaging, email or over the web.

- Content is usually limited to 140 characters

- Twitter – the most popular microblogging service that sends “tweets”, is a useful business tool to:

- quickly share product information

- Gather real-time customer feedback and market intelligence

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7. **Wikis:** is a website made up entirely of content posted by users. Wikis have an “edit” link on each page that allows any user to add, change, or delete material, thus fostering easy collaboration.

- harness the collective intelligence of Internet users, combining the input of many individuals

- provide a central repository for capturing constantly updated product features and specifications, tracking issues, resolving problems, and maintaining project histories

- enable companies to collaborate with customers, suppliers, and other business partners on projects.

8. **Social Networking Websites:** is a social structure composed of individuals, groups, or organizations linked by values, visions, ideas, financial exchange, friendship, kinship, conflict, or trade.

- Well-known social networking sites include:

- Facebook

- Flickr

- LinkedIn

- YouTube

Enterprise Social Networks

9. **Enterprise Social Networks:** Business-oriented social networks can be public, such as LinkedIn.com.

- Business oriented social networks that can be:

- Public: 3rd party owned and managed
- Private (in-house, behind the firewall):
 - for employees, former employees, business partners and/or customers
- Used for many processes, including:
 - Network and community building – eg. employees can interact with coworkers, making social and business oriented connections

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- Social collaboration, publishing, views and feedback
- Social intelligence and analytics
- Example: IBM connects 426,000 employees in 170 countries for work and social

10. **Mashups:** is a website that takes different content from a number of other websites and mixes it together to create a new kind of content.

- Example: Google Maps, credited with providing the start for mashups:
 - Users can display their own data on a Google Map, on their own website. Examples:
- Store locations, available apartments, etc.

Fundamentals of Social Computing in Business

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Benefits to Customers Benefits to Businesses

Better and faster vendor responses to complaints, because customers can air their complaints in public (on Twitter, Facebook, and YouTube)

Test new products and ideas quickly and inexpensively

Customers can assist other customers (e.g., in online forums)

Learn a lot about their customers

Customers' expectations can be met more fully and quickly

Identify problems quickly and alleviate customer anger

Customers can easily search, link, chat, and buy while staying on a social network's page

Learn about customers' experiences via rapid feedback

Increase sales when customers discuss products positively on social networking site

Create more effective marketing campaigns and brand awareness

Use low-cost user-generated content; for example, in marketing campaigns

Obtain free advertising through viral marketing

Identify and reward influential brand

Risks of Computing

- Customers negative posts
- Need to monitor and respond promptly and effectively
- Other risks:
- Invasion of privacy
- Violation of intellectual property and copyright
- Employees reluctance to participate
- Data leakage of personal information or corporate strategic information
- Poor or biased quality users generated content
- cyberbullying/cyberstalking and employee harassment

Social Computing in Business: Shopping

Social shopping: a method of electronic commerce that takes all of the key aspects of social networks - friends, groups, voting, comments, discussions, reviews etc - and focuses them on shopping. It includes:

- **Ratings, reviews, and recommendations**
- **Customer ratings and reviews:** Integrated into the vendor's web page, a social network page, a customer review site, or in customer feeds (e.g., Amazon, iTunes, Buzzillions, Epinions).
- **Expert ratings and reviews:** Views from an independent authority (e.g., Metacritic).
- **Sponsored reviews:** Paid-for reviews (e.g., SponsoredReviews, PayPerPost).
- **Conversational marketing:** Individuals converse via email, blog, live chat, discussion groups, and tweets. Monitoring these conversations yields rich data for market research and customer service.
- **Group shopping websites** such as Groupon (www.groupon.com) and LivingSocial (www.livingsocial.com, see Figure 16.4) offer major discounts or special deals during a short time frame.

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advocates

- **Shopping communities and clubs:** Shopping clubs host sales for their members that last just a few days and usually feature luxury brands at heavily discounted prices. Club organizers host three to seven sales per day, usually via email messages that entice club members to shop at more than 70 percent off retail—but quickly, before supplies run out.
- **Social Marketplaces and Direct Sales:** act as online intermediaries that harness the power of social networks for introducing, buying, and selling products and services. A social marketplace helps members market their own creations. For example:
 - Kijiji
 - Etsy
- **Peer-to-peer Shopping Models:** are the high-tech version of old-fashioned bazaars and bartering systems. Individuals use these models to sell, buy, rent, or barter online with other individuals.
- **Person-to-Person sharing:** the main sectors of the person-to-person sharing marketplace include the following:
 - **Peer-to-peer lending:** For example, Lending Club (www.lendingclub.com) and Prosper (www.prosper.com).
 - **Peer-to-peer accommodations:** For example, Airbnb (www.airbnb.com).

- **Car sharing:** For example, Uber (www.uber.com).
- **Business-to-business sharing:** Many companies have embraced this concept. Let's take a look at two of these firms.

- **Marriott International (www.marriott.com) offers meeting spaces on LiquidSpace (<https://liquidspace.com>).** LiquidSpace is an online marketplace that allows people to rent office space by the hour or the day. Hundreds of Marriott hotels now list meeting spaces, and the program has expanded the company's reach by attracting local businesspeople from surrounding areas.

- **FLOOW2 (www.floow2.com),** based in the Netherlands, calls itself a **“business-to-business sharing marketplace where companies and institutions can share equipment, as well as the skills and knowledge of personnel.”** The company lists more than 25,000 types of equipment and 121

services in industries such as construction, agriculture, transportation, real estate, and health care.

Social Computing in Business: Marketing

Marketing: building profitable customer relationships by creating value for customers and capturing value in return

Components of a marketing campaign include:

1. Defining your target audience
2. Developing your message (how you will solve their problem)
3. Decide on how you will deliver your message
4. Follow up with the customers/audience

Advertising

- **Social advertising:** makes use of the social context of the user viewing the ad. It is the first form of advertising that leverages forms of social influences such as peer pressure, friend recommendations and likes

- **Conducting Market Research Using Social Networks** is used to develop social intelligence.

- **Conversational marketing:** is the process of using social computing to obtain feedback.

- **Tools for conversational marketing and social networks market research** include: Facebook, Twitter, LinkedIn

Social Computing in Business: Customer Relationship Management

Customers are now incredibly empowered. Companies are closely monitoring social computing not only because they are mindful of the negative comments posted by social network members but also because they perceive an opportunity to involve customers proactively to reduce problems through improved customer service.

Empowered customers know how to use the wisdom and power of crowds and communities to their benefit. These customers choose how they interact with companies and brands, and they have elevated expectations concerning their experiences with a 122

company. They are actively involved with businesses, not just as purchasers but also as advocates and influencers. As a result, businesses must respond to customers quickly and appropriately.

Social Computing in Business: Human Resources Management

1. Recruiting

Both recruiters and job seekers are moving to online social networks as recruiting

platforms. Enterprise recruiters are scanning online social networks, blogs, and other social resources to identify and find information about potential employees.

2. Finding a Job

Like the majority of job hunters, you will probably conduct at least part of your search online because the vast majority of entry-level positions are now listed only online. Job sites are the fastest, least expensive, and most efficient method to connect employers with potential employees.

3. Employee Development

To this end, a number of HR professionals are using enterprise social tools such as Chatter (www.salesforce.com/chatter), Yammer (www.yammer.com), and Tibbr (www.tibbr.com) to tap into the wisdom of every employee. These tools help connect employees to work efficiently across organizations and to collaborate on sales opportunities, campaigns, and projects. They help companies simplify workflows and capture new ideas. They enable HR managers to find subject matter experts within the organization, recommending relevant people for every project team, sales team, and other functions.

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Week 11: Acquiring Information Systems (IS)

How can information systems be acquired?

1. Buy it and use it as is:

- a. Off the shelf
- b. Would not lead to maximising your competitive advantage
- c. Least expensive solution

2. Buy it and customize it:

- a. Depends on what your needs and target is
- b. Good cost effective alternative from starting from scratch

3. Rent or lease it

- a. Temporary, nothing to worry about
- b. No maintenance or anything
- c. Everything is handled by the third party you're paying a fee to

4. Build it yourself:

- a. Lots of work
- b. Will be very time consuming and expensive
- c. But this will be your biggest competitive advantage if critical to your operations

5. Outsource it:

- a. Completely externalise all costs associated to the IS and you're just paying a fee for this service
- b. Pay per usage
- c. Eg Cloud Computing

Difference between Acquiring a New IS and Acquiring New Software

Acquiring new software is **NOT** the same as acquiring new information systems, because there is a lot more to think about in systems than just software, even though software is part of the IS.

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What is Outsourcing?

- **Outsourcing:** is the process of hiring another organization to perform a service
- Functions such as logistics, marketing, customer service, manufacturing etc
- The outsourced vendor can be domestic or international
- **Offshoring** is when the vendor is overseas

- ☐ Particularly important in IT services due to the cost advantage
- ☐ US companies would outsource to Canada due to lower wages
- ☐ Privacy and security must be taken into consideration
- **Application Service Providers (ASPs)** are a form of outsourcing
- ☐ You're paying to use a platform through a service provider that provides platforms
- ☐ Eg. Sales force

Reasons for Outsourcing

- An easy way to gain expertise
- Concern cost reductions
- To reduce development risk

Application Service Providers

- **ASP agreement:** an organization contracts with a vendor to “rent” applications from the vendor company on a fee-for-service basis
- Vendor maintains the system at its own web location and the client organization accesses the application on the vendors website
- ☐ Vendor can provide a standardized software to many companies while maintaining a single site
- Reduces cost of supporting application and cost of outsourcing
- Payments are monthly or yearly, can be based on number of users

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IT Projects

- IT projects have a large information technology component (in terms of budget or personnel)
- ☐ Scope (objective)
- ☐ Start and end date
- ☐ Temporary use of resources
- ☐ Unique
- ☐ Accomplish something new
- Hard to estimate time, budget, and scope
- ☐ This changes as projects evolve

Manage your Business Technology

What should you know about IT Operations and IT Projects?

- **IT Operations:** the delivery of service, maintenance, protections and management of IT infrastructure
- **IT Projects:** the renewal and adaptation of IT infrastructure is normally accomplished through projects
- ☐ Operational work and project work tend to attract two different types of IT professionals
- ☐ But these two fields rely on each other for success

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What the IT Department Does

Why are IT projects so risky?

- Most IT project definitions are not easy to graphically represent
- Lack of a good model is an important risk to recognize in IT projects
- Good estimates are difficult to develop because the technology is continually changing

- Being able to monitor progress is another challenge for IT projects

Some Risks Inherent in IT Projects

- Lack of experience in the team
- Projects usually explore new things that many people do not know about
- Lack of support from top management
- Lack of participation from system users
- Users aren't usually involved from the get go, which means that by the time the project is complete, you don't know what the difficulties are and what is required
- Which is not gonna fulfill the expectations of the user and may be too complex
- Unclear and uncertain project requirements
- A high level of technical complexity, and changes in the project environments

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What is an SDLC?

- The **systems development life cycle (SDLC)**: is the **classic** process used to acquire information systems
- To successfully acquire and maintain information systems, there are basic tasks that need to be performed
- These basic tasks are combined into phases of **systems development**

SDLC Five Phases (AKA Waterfall Model)

1. System definition

- Management's statement defines new system

2. Requirement analysis

- Identify features and functions

3. Component design

- Based on approved user requirements

4. Implementation

- Implement, test, and install new system

5. System maintenance

- Repair, add new features, maintain

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Problems with SDLC

- SDLC **waterfall method**
- Phases are not supposed to be repeated
- Often teams have need to repeat requirements and/or design phases
- Difficulty in documenting requirements
- Analysis paralysis or uncertain requirements
- Scheduling and budget difficulties
- Multiyear projects difficult to properly schedule
- Estimations on labour often produce insufficient budgets

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Agile Lifecycle

Check links bc this is how most organizations function nowadays

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Scrum!

- Identifying upfront all of your backlogs/use cases

- Start putting together all these used cases into small modules in cyclical approach
- Every morning there's a daily scrum so that people don't waste anytime
- We resolve any issues and move forward with the agenda to get to a potentially shippable product increment
- Typical with apps for example
- Ever-evolving expectations
- Very agile

Product Backlog

- "The requirements" - use cases
- A list of all desired work on project
- Ideally expressed as a list of user stories along with "story points," such that each item has value to users or customers of the product

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- Prioritized by the product owner
- Reprioritized at start of each sprint
- Very dynamic

Example of Use Case

Instead of Use Cases, Agile project owners do "user stories"

- **Who** (user role) - is this a customer, employee, admin, etc?
- **What** (goal) - what functionality must be achieved/developed?
- **Why** (reason) - why does the user want to accomplish this goal?

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Example: "As a user I want to log in, so I can access subscriber content"

Sprint Burndown Chart

- A display of what work has been completed and what is left to complete
- One for each developer or work item
- Updated every day
- (make best guess about hours/points completed each day)

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Process Comparison

Week 12: Privacy and Ethics

What is Ethics?

- A branch of philosophy
- Study of what is right or wrong
- How should we act?
- As a group or individual within the official and unofficial boundaries of different societies
- What is a virtue?
- What makes me a good person?

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● **Ethics:** is the set of principles of right and wrong that individuals use to make choices that guide their behaviour.

- Deciding what is right or wrong is not always easy or clear-cut.
- Fortunately, there are many frameworks that can help us make ethical decisions.

Ethical Frameworks

The Utilitarian Approach

The utilitarian approach states: that an ethical action is the one that provides the most good or does the least harm.

The ethical corporate action would be the one that produces the greatest good and does the least harm for all affected parties—customers, employees, shareholders, the community, and the physical environment.

The Rights Approach

The rights approach maintains: that an ethical action is the one that best protects and respects the moral rights of the affected parties.

- Moral rights can include the rights to make one's own choices about what kind of life to lead, to be told the truth, to be not injured, and to enjoy a degree of privacy.
- Which of these rights people are actually entitled to—and under what circumstances—is widely debated.
- Nevertheless, most people acknowledge that individuals are entitled to some moral rights.
- An ethical organizational action would be one that protects and respects the moral rights of customers, employees, shareholders, business partners, and even competitors.

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The Fairness Approach

The fairness approach: posits that ethical actions treat all human beings equally, or, if unequally, then fairly, based on some defensible standard.

- For example, most people might believe it is fair to pay people higher salaries if they work harder or if they contribute a greater amount to the firm.
- However, there is less certainty regarding CEO salaries that are hundreds or thousands of times larger than those of other employees.
- Many people question whether this huge disparity of wages is based on a defensible standard or whether it is the result of an imbalance of power and hence is unfair.

The Common Good Approach

The common good approach: highlights the interlocking relationships that underlie all societies.

This approach argues that respect and compassion for all others is the basis for ethical actions.

It emphasizes the common conditions that are important to the welfare of everyone. These conditions can include a system of laws, effective police and fire departments, health care, a public educational system, and even public recreation areas.

Traditional and GVV Approaches to Resolving Ethical Issues

These four standards are used to develop a general framework for ethics (or ethical decision making). Two such frameworks are shown in Table 18.1: a generic “traditional” approach, and the GVV (giving voice to values) approach.

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TRADITIONAL APPROACH GIVING VOICE TO VALUES (GVV) APPROACH

Recognize an ethical issue

- Could this decision or situation damage someone or some group?

Identify an ethical issue

- What are the different issues that give rise

to the ethical issue?

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- Does this decision involve a choice between a good and a bad alternative?
- Is this issue about more than what is legal? If so, how?

- What are the values of the individuals or organizations underlying the ethical issue(s)?

- Is there a possibility of action to resolve the ethical issue?

Get the facts

- What are the relevant facts of the situation?
- Do I know enough to make a decision?
- Which individuals and/or groups have an important stake in the outcome?
- Have I consulted all relevant persons and groups?

Purpose and choice

- What personal choices do you have in reacting to this ethical issue?
- What is your most appropriate professional choice, being guided by professional rules, and what would be a “good” choice?

Evaluate alternative actions

- Which option will produce the most good and do the least harm? (the utilitarian approach)
- Which option best respects the rights of all stakeholders? (the rights approach)
- Which option treats people equally or proportionally? (the fairness approach)
- Which option best serves the community as a whole, and not just some members? (the common good approach)

Stakeholder analysis

- Who is affected by the ethical issue?
- How are they affected, considering if I do give voice to resolving the issue?
- How are they affected, considering if I do not give voice to resolving the issue?
- How can I connect with the stakeholders to best deal with the ethical issue?

Make a decision and test it

- Considering all the approaches, which option best addresses the situation?
- What is the outcome of my decision and what should I do next?

- How can I implement my decision with the greatest care and attention to the concerns of all stakeholders?
- How did my decision turn out, and what did I learn from this specific situation?

Powerful response

- Who is my audience?
- What types of things could I say to provide a response to the ethical issue?
- What are some inhibiting arguments that would prevent me from acting?
- What could I say in response to the inhibiting arguments (called an enabling argument)?
- What external arguments (called levers) support my enabling arguments?
- What external research supports or refutes my arguments?

Ethics in the Corporate Environment

A code of ethics: is a collection of principles intended to guide decision making by members of the organization.

Keep in mind that different codes of ethics are not always consistent with one another.

Therefore, an individual might be expected to conform to multiple codes.

For example, a person who is a member of two large professional computing-related organizations may be simultaneously required by one organization to comply with all applicable laws and by the other organization to refuse to obey unjust laws.

Fundamental tenets of ethics include responsibility, accountability, and liability:

1. **Responsibility:** means that you accept the consequences of your decisions and actions.
2. **Accountability:** means determining who is responsible for actions that were taken.
3. **Liability:** is a legal concept that gives individuals the right to recover the damages done to them by other individuals, organizations, or systems.

Where do we use applied ethics?

- Code of ethics
- Deontology
- Governance
- Laws

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Scripting and coaching

- What words (script) could I use when talking about the ethical issue? (consider both positive and negative responses)
- Who can I practise with?
- How would I approach my audience to provide the best opportunity for discussing the ethical issue?

Rollande's 3 Ethical Review Questions

1. Is it legal?
2. Do you, family members or friends get any benefits you wouldn't have if you weren't

in this position?

3. Would you have a little or great reluctance if it became known to the general public?

Before you go any further, it is critical that you realize that what is *unethical* is not necessarily *illegal*.

Advancements in information technologies have generated a new set of ethical problems:

- Computing processing power doubles roughly every 18 months, meaning that organizations are more dependent than ever on their information systems.
- Organizations can store increasing amounts of data at decreasing costs. As a result, they can maintain more data on individuals for longer periods of time.
- Going further, computer networks, particularly the Internet, enable organizations to collect, integrate, and distribute enormous amounts of information on individuals, groups, and institutions.
- These developments have created numerous ethical problems concerning the appropriate collection and use of customer information, personal privacy, and the protection of intellectual property.

Ethics and Information Technology

The diversity and ever-expanding use of IT applications have created a variety of ethical issues. These issues fall into four general categories: privacy, accuracy, property, and accessibility.

1.Privacy issues: involve collecting, storing, and disseminating information about individuals.

2.Accuracy issues: involve the authenticity, fidelity, and correctness of information that is collected and processed.

3.Property issues: involve the ownership and value of information.

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4.Accessibility issues: revolve around who should have access to information and whether they should pay a fee for this access.

Privacy

Privacy: is the right to be left alone and to be free of unreasonable personal intrusions.

Information privacy: is the right to determine when, and to what extent, information about you can be gathered and/or communicated to others.

Privacy rights apply to individuals, groups, and institutions.

The right to privacy is recognized today by the Canadian and U.S. federal governments, either by statute or in common law.

Privacy can be interpreted quite broadly. However, court decisions in many countries have followed two rules fairly closely:

1. The right of privacy is not absolute. Privacy must be balanced against the needs of society.

2. The public's right to know supersedes the individual's right of privacy.

These two rules illustrate why determining and enforcing privacy regulations can be difficult.

As we discussed earlier, rapid advances in information technologies have made it much easier to collect, store, and integrate vast amounts of data on individuals in large databases.

On an average day, data about you are generated in many ways:

- surveillance cameras located on toll roads
- on other roadways
- in busy intersections
- in public places

- and at work
- credit card transactions
- telephone calls (landline and cellular)

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- banking transactions; queries to search engines
- and government records (including police records).

These data can be integrated to produce a digital dossier, which is an electronic profile of you and your habits.

The process of forming a digital dossier is called profiling.

Data aggregators in the United States, such as **LexisNexis** (www.lexisnexis.com) and **Axciom** (www.axciom.com), are prominent examples of profilers.

These companies **collect public data** such as real estate records and published telephone numbers, in addition to nonpublic information such as financial data and police, criminal, and motor vehicle records. Statistics Canada (www.statcan.gc.ca), Canada's national statistics agency, provides aggregated information about businesses and individuals.

- Data aggregators then integrate these data to form digital dossiers on most adults in the United States.
- They sell these dossiers to law enforcement agencies and companies that conduct background checks on potential employees.
- They also sell the dossiers to companies that want to know their customers better, a process called customer intimacy.

Data on individuals can also be used in more controversial ways. For example, in August 2015 hackers posted a list of “clients” from the Ashley Madison (www.ashleymadison.com) website based on a hack announced on July 21, 2015 (we discuss hacks in the next chapter). Ashley Madison's website says it is the “world's leading married dating service for discreet encounters” and that as of January 2016 it had over 43 million anonymous members. Subsequent articles led to suicides and bad publicity for confirmed clients of the site, while others complained about fake names on the site, such as one man's 12-year-old daughter.

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Electronic Surveillance

- Electronic surveillance is rapidly increasing, particularly with the emergence of new technologies.
- Electronic surveillance is conducted by employers, the government, and other institutions.
- Canadians today live with a degree of surveillance that would have been unimaginable just a few years ago.
- For example, surveillance cameras track you at airports, subways, banks, and other public venues.
- In addition, inexpensive **digital sensors** are now everywhere.
- They are incorporated into laptop webcams, video-game motion sensors, smartphone cameras, utility meters, passports, and employee ID cards.
- Emerging technologies such as low-cost digital cameras, motion sensors, and biometric readers are helping to increase the monitoring of human activity.
- In addition, the costs of storing and using digital data are rapidly decreasing. The result is an explosion of sensor data collection and storage.
- The average price of a smartphone has increased 17 percent since 2000.
- However, **the phone's processing capability has increased by 13,000 percent** during that time, according to technology market research firm ABI

Research (www.abiresearch.com).

- A special problem arises with smart phones that are equipped with **global positioning system (GPS) sensors**.
- These sensors routinely geotag photos and videos, embedding images with the longitude and latitude of the location shown in the image.
- Thus, you could be inadvertently supplying criminals with useful intelligence by posting personal images on social networks or photo-sharing websites.
- These actions would show the criminals exactly where you live.
- Another example of how new devices can contribute to electronic surveillance is **facial recognition technology**.
- This technology can now match faces even in regular snapshots and online images. For example, Intel and Microsoft have introduced in-store digital billboards that can recognize your face.

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- These billboards can keep track of the products you are interested in based on your purchases or browsing behaviour.
- One marketing analyst has predicted that your experience in every store will soon be customized.
- Google and Facebook are using facial-recognition software—Google Photos and Facebook Photo Albums—in their popular online photo-editing and sharing services.
- Both companies **encourage users to assign names** to people in photos, a practice referred to as photo tagging.
- Facial-recognition software then indexes facial features.
- Once an individual in a photo is tagged, the software searches for similar facial features in untagged photos.
- This process allows the user to quickly group photos in which the tagged person appears.
- Significantly, the individual is not aware of this process.
- **Why is tagging important?**
- The reason is that once you are tagged in a photo, that photo can be used to search for matches across the entire Internet or in private databases, including databases fed by surveillance cameras.
- One privacy lawyer has asserted that **losing your right to anonymity** would have a chilling effect on where you go, whom you meet, and how you live your life.

Privacy in the Workplace

However, electronic surveillance has become a reality in the workplace as well. In general, employees have very limited legal protection against surveillance by employers. The law supports the right of employers to read their employees' email and other electronic documents and to monitor their employees' Internet use.

- Today, **more than three quarters of organizations routinely monitor their employees' Internet usage**.
- In addition, **two thirds use software to block connections to inappropriate websites, a practice called URL filtering**.

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- Furthermore, organizations are installing monitoring and filtering software to enhance security by blocking malicious software and to increase productivity by discouraging employees from wasting time.

Personal Information in Databases

Information is being kept about individuals in many databases. Perhaps the most visible locations of such records are credit-reporting agencies. Other institutions that store personal information include:

1. banks and financial institutions;
2. cable TV,
3. telephone,
4. utilities companies;
5. employers;
6. mortgage companies;
7. hospitals;
8. schools and universities;
9. retail establishments;
10. government agencies (Canada Revenue Agency, your province, your municipality);
11. many others.

There are several concerns about the information you provide to these record keepers. Some of the major concerns are as follows:

- Do you know where the records are?
- Are the records accurate?
- Can you change inaccurate data?
- How long will it take to make a change?
- Under what circumstances will the personal data be released?
- How are the data used?
- To whom are the data given or sold?
- How secure are the data against access by unauthorized people?

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Information on Internet Bulletin Boards, Newsgroups, and Social Networking Sites

How does society keep owners of bulletin boards from disseminating information that may be offensive to readers or simply untrue?

This is a difficult problem because it involves the conflict between freedom of speech on the one hand and privacy on the other.

There is no better illustration of the conflict between free speech and privacy than the Internet.

Many websites contain anonymous, derogatory information on individuals, who typically have little recourse in the matter.

Many organizations use the Internet in examining job applications, including searching on Google and on social networking sites.

Consequently, derogatory information contained on the Internet can harm a person's chances of being hired.

Privacy Codes and Policies

Privacy policies/codes: an organization's guidelines for protecting the privacy of customers, clients, and employees.

- In many corporations, senior management has begun to understand that when they collect vast amounts of personal information, they must protect it.
- In addition, many organizations give their customers some voice in how their information is used by providing them with opt-out choices.
- **The opt-out model of informed consent** permits the company to collect personal information until the customer specifically requests that the data not be collected.
- Privacy advocates prefer the opt-in model of informed consent, which prohibits an

organization from collecting any personal information unless the customer specifically authorizes it.

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- Although the opt-out model is a common approach, Canada's privacy commissioner states that consent should be sought, which is the opt-in model.
- Canada's anti-spam legislation, **Bill C-28**, requires that organizations use the opt-in model for the sending of emails.
- This means that organizations need to have data collection processes so that they can keep records of which customers have agreed to receive emails, and which ones have not.

Platform for Privacy Preferences (P3P)

- One privacy tool available to consumers is the **Platform for Privacy Preferences (P3P)**.
- It was developed by the **World Wide Web Consortium**, a group that creates standards for the Web.
- P3P automatically communicates privacy policies between an electronic commerce website and visitors to that site.
- P3P enables visitors to determine the types of personal data that can be extracted by the websites they visit.
- It also allows visitors to compare a website's privacy policy with the visitors' preferences or with other standards, such as the Canadian Standards Association (CSA) Model Code for the Protection of Personal Information or the European Union Directive on Data Protection.

Personal Information Protection and Electronic Documents Act (PIPEDA).

- Canada's privacy legislation is called the **Personal Information Protection and Electronic Documents Act (PIPEDA)**.
- It became effective January 1, 2004.
- The legislation applies to businesses and other organizations, such as non-profit organizations.
- PIPEDA is based upon the principles in the Canadian Standards Association Model Code.
- As part of the legislation, organizations are required to establish a privacy policy, as well as procedures to ensure that the policy is adhered to.

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Privacy Policy Guidelines: A Sampler

Despite privacy codes and policies, and despite opt-out and opt-in models, guarding whatever is left of your privacy is becoming increasingly difficult. However, several companies are providing help in maintaining your privacy, as you see in the chapter closing case.

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DATA COLLECTION

Data should be collected on individuals only for the purpose of accomplishing a legitimate business objective.

Data should be adequate, relevant, and not excessive in relation to the business objective.

Individuals must give their consent before data pertaining to them can be gathered. Such consent may be implied from the individual's actions (e.g., applications for credit, insurance, or employment).

DATA ACCURACY

Sensitive data gathered on individuals should be verified before they are entered into the database.

Data should be kept current, where and when necessary.

The file should be made available so that the individual can ensure that the data are correct.

In any disagreement about the accuracy of the data, the individual's version should be noted and included with any disclosure of the file.

DATA CONFIDENTIALITY

Computer security procedures should be implemented to ensure against unauthorized disclosure of data. These procedures should include physical, technical, and administrative security measures.

Third parties should not be given access to data without the individual's knowledge or permission, except as required by law.

Disclosures of data, other than the most routine, should be noted and maintained for as long as the data are maintained.

Data should not be disclosed for reasons incompatible with the business objective for which they are collected.

International Aspects of Privacy

- As the number of online users has increased globally, governments throughout the world have enacted a large number of inconsistent privacy and security laws.

- This highly complex global legal framework is creating regulatory problems for companies.

- Approximately 50 countries have some form of data protection laws.

- Many of these laws conflict with those of other countries, or they require specific security measures.

- Other countries have no privacy laws at all.

The absence of consistent or uniform standards for privacy and security obstructs the flow of information among countries (transborder data flows).

The European Union, for one, has taken steps to overcome this problem.

- In 1998, the European Community Commission (ECC) issued guidelines to all of its member countries regarding the rights of individuals to access information about themselves.

- The EU data protection laws are stricter than the North American laws and therefore could **create problems for North American-based multinational corporations, which could face lawsuits for privacy violations.**

The transfer of data into and out of a nation without the knowledge of either the authorities or the individuals involved raises a number of privacy issues.

- Whose laws have jurisdiction when records are stored in a different country for reprocessing or retransmission purposes?

- For example, if data are transmitted by a Polish company through a Canadian satellite to a British corporation, which country's privacy laws control the data, and at what points in the transmission?

- Questions like these will become more complicated and frequent as time goes on.

- Governments must make an effort to develop laws and standards to cope with rapidly changing information technologies to solve some of these privacy issues.

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Week 12: Cybersecurity

Security: the degree of protection against criminal activity, danger, damage, and/or loss.

Information security: is all of the processes and policies designed to protect an organization's information and information systems (IS) from unauthorized access, use, disclosure, disruption, modification, or destruction.

- Network security
- Physical security
- Operations security
- Communications security
- Personnel security

Organizations collect huge amounts of information and employ numerous information systems that are subject to myriad threats.

- A threat to an information resource is any danger to which a system may be exposed.
- The exposure of an information resource is the harm, loss, or damage that can result if a threat compromises that resource.
- An information resource's vulnerability is the possibility that the system will be harmed by a threat.

What is Cybersecurity?

- It is a variation of information security, where information security relates to information used by organisations in the realisation of its mission.
- Cybersecurity is security in cyberspace.

Schatz (2017) defined of cybersecurity as:

- “The approach and actions associated with security risk management processes followed by organizations and states to protect **confidentiality, integrity and availability** of data and assets used in cyberspace. The concept includes **guidelines, policies and collections of safeguards, technologies, tools and**

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training to provide the best protection for the state of the cyber environment and its users.”

Business Value of Data (Security Objectives)

- **Confidentiality** is an organizational concept, whereas privacy is an ethical concept
- **Integrity:** we don't want the information to be changed, we want it to stay the same bc it has value to us
- **Availability:** we need this data at a certain time, if we cant access it, it doesn't have value

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What is Risk?(Crichtons risk triangle)

- **E: element of risk**
- **T: time**
- **S: space**
- For a certain time, in a given space for a certain asset for this risk to exist we need all three

Vulnerability:

- We need a threat, something that's going to interact with this asset
- We need to protect the asset, but the asset needs to be vulnerable
- Vulnerability is targeted through an exploit or attack
- The threat has to exploit a vulnerability
- The outcome has to have some negative impact on the organization

- But when the outcome is positive we think of it as opportunity

Threat: category of object, person, or other entity that poses a potential risk of loss to an asset

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- Could be hackers, foreign governments, environmental threats or a combination of all

Attack: intentional or unintentional action that could represent the unauthorized modification, damage, or loss of an information asset

- Something that will affect the integrity and availability of the data

Vulnerabilities and Exploits

- **Threat agent:** specific instance of a general threat
- **Well-known vulnerabilities:** vulnerabilities that have been examined, documented and published
- CVE: common vulnerabilities that are published
- **“Exploit”:** threat agents attempt to exploit a system or information asset
- Specific recipe that an attacker creates to formulate an attack

Business Impacts

Tangible and physical:

- Destruction or reduced performance of equipment
- Morbidity, mortality

Financial:

- Loss of clientele, loss of markets
- Loss of reputation
- Loss of market capitalization, loss of value

Psycho-social:

- Loss of confidence in the organization
- Psychological disorders in teams
- Social unrest

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Taxonomy of Organizational Cyber-harms

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Risk Scenario Overview

- You either start bottom up or top down

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Risk Scenario Structure

Balancing Security and Access

- Information security is a process, not an end
- Organizations need to balance protection of information, the needs of authorized users to access data and costs
- Are you risk seeking or risk averse?
- What stage are you in (start up?)
- Security must allow reasonable access yet protect against threats
- You should pay 8% up to 12% for your security

Put the Business Needs First

- **Protect:** protect the organization's ability to function
- **Enable:** enable the safe operation of applications implemented on the organizations IT systems

- **Protect:** protect the data the organizations collects and uses
- **Safeguard:** safeguard the technology assets in use at the organization

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Create a Security Organization

Chief Information Security Officer (CISO)

- Responsible for the assessment, management, and implementation of information security in the organization

Business Information Security Officer (BISO)

- Represents the CISO in the strategic business units

Strategic Information Security Teams

- Communications and training
- Strategic purchasing and project management
- Governance, risk and conformity

Operational Information Security Teams

- Blue team design cyber defensive measures and threat intelligence
- Red team provide real-world attack simulations designed to assess and significantly improve the effectiveness of an entire information security programme

Use a Security Perimeter and Defense

- **Security perimeter:** defines the boundary between the outer limit of an organization's security and the beginning of the outside network
- **Defense in depth:** layered implementation of security
- **Redundancy:** implementing technology in layers

The Human Factor

- People are our biggest weakness
- Using **social engineering** to deceive users
- Phishing

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Given the situation good people can do bad things

MOVE:

- **M**otive
- **O**ppportunity
- **V**alue
- **E**scape

More threats

Malicious Code

Malicious code

- Includes viruses, worms, trojan horses, and active web scripts
- Executed with the intent to destroy and steal information

Polymorphic, multivector worm

- Constantly changes the way it looks

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- Uses multiple attack vectors to exploit a variety of vulnerabilities in commonly used software

Compromising Passwords

- **Bypass access controls by guessing**
- If we know enough about the person through social engineering
- **Cracking passwords from hash values**

- ☐ Encrypted password file
- **Brute force attack**
- ☐ Every combination of letters, numbers and characters
- **Dictionary attack**
- ☐ Using the dictionary

Denial-of-Service

Denial-of-Service (DoS) attack

- Attacker sends a large number of connection or information requests to a target
- So many requests are made that the target system cannot handle them along with other, legitimate requests for service

Distributed denial-of-service (DDoS)

- Coordinated stream of requests against a target from many locations at the same time

Any system connected to the internet is a potential target for denial-of service attacks

Spoofing

- Intruder sends messages to IP addresses that indicate to the recipient that the messages are coming from a trusted host

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Man-in-the-Middle

Eg fake access point in cafe or airport to gain access to information and traffic

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Email Attacks

Email

- An efficient delivery mechanism for attacks rather than the attack itself

Spam

- Used as a way to make malicious code attacks more effective by sending lots of emails

Mail bomb

- Attacker routes large quantities of email to the target system

Social Engineering

Social engineering: Process of using social skills to convince people to reveal access credentials or other valuable information to the attacker

“People are the weakest link. You can have the best technology, then someone calls an unsuspecting employee. That’s all she wrote, baby. They got everything” - Kevin Mitnick

Technical Solutions

Zero Trust Security

An epistemological shift of Trust

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5P Strategy

1. Plan
2. Prevent
3. Protect
4. Punish
5. Prosecute

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Increase Organizational Maturity

Non-technical Solutions

Leadership

- Giving real authority and resources to the CISO
- Set an example and mobilize
- Create a risk culture

Develop and encourage best practices

- Make IM?BCP?DRP action plans
- Moving from compliance to strategic

Collect only the necessary information

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Create a High-reliability Organization

1. Integrity
2. Depth of knowledge
3. Procedural compliance
4. Force full backup
5. Adopt a questioning attitude
6. Communication formality

Cyber security breaches caused by a human error always involve the violation of one or more of the six principles

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Three Lines of Defense

Case Study: Ashley Madison

- The parent company Avid Life Media Inc is Canadian
- Users in 50 countries
- July 15, 2015 the impact team hacker group announced that it had hacked ALM and obtained the details of 36 million customers of its sites
- Violated PEPIDA

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Owner of risks, processes and controls

- Identifies and manages risks related to its processes

- Manages activities respecting the organization's risk appetite

- Is accountable for the performance of its activities

- Designs, implements and maintains effective internal controls

- Identifies situations of potential conflicts of interest and remedies them by an adequate separation of duties

- Produces and reports its risk profile

Risk Monitoring • Establishes risk management frameworks and ensures their application

- Performs monitoring and critical review of the risk management carried out by the first line and the effectiveness of the controls it puts in place

- Advise and equip the first line so that it fulfills its responsibilities

- Monitors and reports on risk appetite

External audit • Gives an independent opinion on the effectiveness of governance, risk management and internal controls within the organization

Poor Practices at ALM

- **Retaining** personal information of users after profiles had been deactivated, deleted or inactive
- **Charging** users to fully delete their profiles
- Not confirming the **accuracy** of user email addresses before collecting or using them
- **No transparency** with users about its personal information handling practices
- No adequate overarching security framework

Recommendations post-investigation

Perform a full review of the protections in place for personal information; informed consent:

- destroy or de-identify information that is no longer needed
- develop guidelines including minimum and maximum retention periods for personal information
- develop guidelines for the destruction of personal information.

Improve its information security governance framework to an appropriate level and implement this framework;

- adequately document this framework and its information security processes in general;
- take steps to ensure staff are aware of and follow safety procedures

Certify compliance with a confidentiality / security standard recognized by unrelated third parties

Case Study: Target

Highlights

- On December 19th 2013, Target Corporation announced that hackers might have gained access to payment card data for 40 million credit and debit card accounts used in its stores in the 19 days between November 27th and December 15th, 2013.
- Installed before Thanksgiving 2013, the malware was designed to steal information on every credit card used at the company's 1,797 U.S. stores.
- The breach was widely reported, beginning on the evening of 18th December.
- Stolen credit card information was aggregated at a server in Russia, and the attackers collected 11 GB data during November and December 2013.
- Credit cards from the Target breach offered on black market forums for sale.
- 40 million credit and debit card numbers and 70 million records of personal information were stolen.

Timeline

The most well-supported theory is that the initial breach didn't occur inside Target.

- It occurred in a vendor, Fazio Mechanical Services, which is a HVAC firm.

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Impact

- Since 2013, customers and banks have filed more than 90 lawsuits against Target for negligence and compensatory damages.

- The costs of responding to the breach have continued to mount.
- At the end of 2015, Target disclosed that costs related to the breach had reached \$290 million. \$100M after tax credits and insurance.
- Target's profit for the 2013 holiday shopping period fell 46% from the same quarter the year before, the cost of Target's data breach represents less than 1% of Target's \$72.6 billion in total revenue for 2014
- Target lost the trust of its customers, investors, and lenders.
- Some argue that Target's costs were a result of poor public relations decisions that led to a loss of consumer trust during the holiday season rather than a result of the data breach itself.
- It cost credit card unions over 200\$M for just reissuing cards.
- CEO of the company, Gregg Steinhafel, resigned.
- Target appointed a new chief information officer Bob DeRodes
- 100M\$ program to enhance security at Target

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Mistakes made by Target in the Incident

- Ignoring critical security alerts,
- six months earlier, the company had begun installing a \$1.6 million malware detection tool designed to inform them of a data breach.
- Target had been warned multiple times by a malware detection tool produced by FireEye Inc.
- The monitoring team in Bangalore for Target Corp. took no actions in response to these alerts.
- They turned off the functionality that can automatically remove a detected malware - just as many other businesses using the same system had done - because it often halted email and Internet traffic by incorrectly flagging data as malware
- Improper segmentation of its network
- Insecure point of sale data handling.
- Allowed millions of customers to continue to use the system when it knew that something was wrong and data was being collected by hackers

Solutions

- Using digital signatures and certificates for ensuring the integrity of operating systems on point of sales.
- **system integrity:** only trusted programs are allowed to be executed or installed on the payment system.
- **program authenticity:** every program or piece of software should pass the test at the integrity center before it is executed on point of sale machines.
- Develop Effective Security Alert Systems
- Data mining
- Controlling Information Flow with Network Segmentation

Five Key Factors that Contribute to Increasing Vulnerability

Today, five key factors are contributing to the increasing vulnerability of organizational information resources, making it much more difficult to secure them:

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1. Today's interconnected, interdependent, wirelessly networked business environment.
2. Smaller, faster, cheaper computers and storage devices.

3. Decreasing skills necessary to be a computer hacker.
4. International organized crime taking over cybercrime.
5. Lack of management support.

Today's interconnected, interdependent, wirelessly networked business environment.

- The first factor is the evolution of the IT resource from mainframe-only to today's highly complex, interconnected, interdependent, wirelessly networked business environment.
- The Internet now enables millions of computers and computer networks to communicate freely and seamlessly with one another.
- Organizations and individuals are exposed to a world of untrusted networks and potential attackers.
- A **trusted network**, in general, is any network within your organization.
- An **untrusted network**, in general, is any network external to your organization.
- In addition, wireless technologies enable employees to compute, communicate, and access the Internet anywhere and anytime.
- Significantly, wireless is an inherently non secure broadcast communications medium.

Smaller, faster, cheaper computers and storage devices

- The second factor reflects the fact that modern computers and storage devices (e.g., thumb drives or flash drives) continue to become smaller, faster, cheaper, and more portable, with greater storage capacity.
- These characteristics make it much easier to steal or lose a computer or storage device that contains huge amounts of sensitive information.
- Also, far more people are able to afford powerful computers and connect inexpensively to the Internet, thus raising the potential of an attack on information assets.

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Decreasing skills necessary to be a computer hacker

- The third factor is that the computing skills necessary to be a hacker are decreasing.
- The reason is that the Internet contains information and computer programs called scripts that users with few skills can download and use to attack any information system connected to the Internet.
- (Security experts can also use these scripts for legitimate purposes, such as testing the security of various systems.)

International organized crime taking over cybercrime

- Cybercrime involves illegal activities conducted over computer networks, particularly the Internet.
- iDefense products are sold by a division of VeriSign (www.verisign.com).
- This company specializes in providing security information to governments and Fortune 500 companies and maintains that groups of well-organized criminal organizations have taken control of a global billion-dollar crime network.
- The network, powered by skillful hackers, targets known software security weaknesses.
- These crimes are typically nonviolent, but quite lucrative.
- Consider, for example, that losses from armed robberies average hundreds of dollars, and those from white-collar crimes average tens of thousands of dollars.

- In contrast, losses from computer crimes average hundreds of thousands of dollars.
- Also, computer crimes can be committed from anywhere in the world, at any time, effectively providing an international safe haven for cybercriminals.
- Computer-based crimes cause billions of dollars in damages to businesses each year, including the costs of both repairing information systems and lost business.

Lack of management support

- For the entire organization to take security policies and procedures seriously, senior managers must set the tone.
- Unfortunately, senior managers often do not do so.
- Ultimately, however, lower level managers may be even more important.

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- These managers are in close contact with employees every day and thus are in a better position to determine whether employees are following security procedures.

Unintentional Threats to Information Systems

The two major categories of threats are unintentional threats and deliberate threats. Unintentional threats are acts performed without malicious intent that nevertheless represent a serious threat to information security. A major category of unintentional threats is human error.

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Human Errors

There are two important points to be made about employees:

1. First, **the higher the level of employee, the greater the threat he or she poses to information security.**

a. This is true because higher level employees typically have greater access to corporate data, and they enjoy greater privileges on organizational information systems.

2. Second, **employees in two areas of the organization pose especially significant threats to information security: human resources and information systems (IS).**

a. Human resources employees generally have access to sensitive personal information about all employees.

b. Likewise, IS employees not only have access to sensitive organizational data but also often control the means to create, store, transmit, and modify those data.

Other employees include **contract labour, consultants, and janitors and guards.**

- Contract labour, such as temporary hires, may be overlooked in information security arrangements.

- However, these employees often have access to the company's network, information systems, and information assets.

- Consultants, although technically not employees, perform work for the company.

- Depending on the nature of their work, they may also have access to the company's network, information systems, and information assets.

Finally, **janitors and guards** are the most frequently ignored people in information security systems.

- Companies frequently outsource their security and janitorial services.

- As with contractors, then, these individuals work for the company, although they technically are not employees.

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- Moreover, they are usually present when most—if not all—other employees have gone home.

- They typically have keys to every office, and nobody questions their presence in even the most sensitive parts of the building. In fact, an article from 2600: The Hacker Quarterly described how to get a job as a janitor for the purpose of gaining physical access to an organization.

Human errors or mistakes by employees pose a serious problem. These errors are typically the **result of laziness, carelessness, or a lack of awareness** concerning information security. This lack of awareness arises from poor education and training efforts by the organization. Human mistakes manifest themselves in many different ways.

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Human Mistake Description and Examples

Carelessness with laptops Losing or misplacing laptops, leaving them in taxis, and so on.

Carelessness with computing devices Losing or misplacing these devices, or using them carelessly so that malware is introduced into an organization's network.

Opening questionable emails Opening emails from someone unknown, or clicking on links embedded in emails

Careless Internet surfing Accessing questionable websites; can result in malware and/or alien software being introduced into the organization's network.

Poor password selection and use Choosing and using weak passwords

Carelessness with one's office Leaving desks and filing cabinets unlocked when employees go home at night; not logging off the company network when leaving the office for any extended period of time.

Carelessness using unmanaged devices Unmanaged devices are those outside the control of an organization's IT department and company security procedures. These devices include computers belonging to customers and business partners, computers in the business centres of

Attackers often employ social engineering to induce individuals to make unintentional mistakes and disclose sensitive information.

Social Engineering

Social engineering: is an attack in which the perpetrator uses social skills to trick or manipulate legitimate employees into providing confidential company information such as passwords.

The most common example of social engineering occurs when the **attacker impersonates someone else** on the telephone, such as a company manager or an information systems employee.

- The attacker claims he forgot his password and asks the legitimate employee to give him a password to use.

- Other common plays include posing as an exterminator, an air-conditioning technician, or a fire marshal.

Examples:

- In one company, a perpetrator entered a company building wearing a company ID

card that looked legitimate.

- He walked around and put up signs on bulletin boards reading “The help desk telephone number has been changed.
- The new number is 555-1234.” He then exited the building and began receiving calls from legitimate employees thinking they were calling the company help desk.
- Naturally, the first thing the perpetrator asked for was username and password.

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hotels, and computers in public places.

Carelessness with discarded equipment Discarding old computer hardware and devices without completely wiping the

memory; includes computers, smart phones, digital copiers, and printers.

Careless monitoring of environmental hazards

These hazards, which include dirt, dust, humidity, and static electricity, are harmful to the operation of computing equipment.

- He now had the information necessary to access the company's information systems.

Two other social engineering techniques are **tailgating** and **shoulder surfing**.

Tailgating: is a technique designed to allow the perpetrator to enter restricted areas that are controlled with locks or card entry.

The perpetrator follows closely behind a legitimate employee and, when the employee gains entry, the attacker asks him or her to “hold the door.”

Shoulder surfing: occurs when a perpetrator watches an employee's computer screen over the employee's shoulder. T

his technique is particularly successful in public areas such as in airports and on commuter trains and airplanes.

Deliberate Threats to Information Systems

Espionage or Trespass

Espionage or trespass occurs when an unauthorized individual attempts to gain illegal access to organizational information.

It is important to distinguish between competitive intelligence and industrial espionage:

- **Competitive intelligence** consists of legal information-gathering techniques such as studying a company's website and news releases, attending trade shows, and similar actions.

- In contrast, **industrial espionage** crosses the legal boundary such as theft of confidential data.

Information Extortion

Information extortion occurs when an attacker either threatens to steal or actually steals information from a company.

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The perpetrator demands payment for not stealing the information, for returning stolen information, or for agreeing not to disclose the information.

Sabotage or Vandalism

Sabotage and vandalism are deliberate acts that involve defacing an organization's website, potentially damaging the organization's image and causing its customers to lose faith in the organization.

One form of online vandalism is a **hacktivist or cyberactivist operation**.

These are cases of high-tech civil disobedience to protest the operations, policies, or actions of an organization or government agency.

For example, the English Twitter account for the Arabic news network Al Jazeera was subject to hacktivism. The Associated Press reported that supporters of Syrian president Bashar Assad used the account to tweet pro-Assad links and messages.

Theft of Equipment or Information

- Smaller more powerful devices are becoming easier to steal and easier for attackers to use to steal information.
- The cost of a stolen laptop includes the loss of data, the loss of intellectual property, laptop replacement, legal and regulatory costs, investigation fees, and lost productivity.
- One form of theft, known as **dumpster diving**: involves rummaging through commercial or residential garbage to find discarded information.
- Paper files, letters, memos, photographs, IDs, passwords, credit cards, and other forms of information can be found in dumpsters.
- Unfortunately, many people never consider that the sensitive items they throw in the garbage might be recovered.
- When this information is recovered, it can be used for fraudulent purposes.
- Dumpster diving is not necessarily theft, because the legality of this act varies.
- Where dumpsters are located on private premises, it is likely illegal.
- However, these laws are enforced with varying degrees of rigour.

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Identity Theft

Identity theft: is the deliberate assumption of another person's identity, usually to gain access to his or her financial information or to frame him or her for a crime. Techniques for illegally obtaining personal information include the following:

- Stealing mail or dumpster diving.
- Stealing personal information in computer databases.
- Infiltrating organizations that store large amounts of personal information (e.g., data aggregators such as Acxiom) (www.acxiom.com).
- Impersonating a trusted organization in an electronic communication (phishing).

Recovering from identity theft is costly, time consuming, and burdensome.

Victims also report problems in obtaining credit and obtaining or holding a job, as well as adverse effects on insurance or credit rates.

In addition, victims state that it is often difficult to remove negative information from their records, such as their credit reports.

- Your personal information can be compromised in other ways. For example, the nature of your identity can be uncovered just by examining your searches in a search engine.
- The ability to analyze all searches made by a single user can enable a criminal to identify who the user is and what he or she is doing.
- Human error is also a common cause of risks associated with identity theft. There are frequent accounts or laptops or equipment being lost or stolen.

Compromises to Intellectual Property

- **Intellectual property**: is the property created by individuals or corporations that is protected under trade secret, patent, and copyright laws.
- **A trade secret**: is an intellectual work, such as a business plan, that is a company secret and is not based on public information.

- An example is the formula for Coca-Cola.

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- **A patent:** is an official document that grants the holder exclusive rights on an invention or a process for 20 years.
- **Copyright:** is a statutory grant that provides the creators or owners of intellectual property with ownership of the property, for the life of the creator plus 50 years.
- Owners are entitled to collect fees from anyone who wants to copy the property.
- The most common intellectual property related to IT deals with software.
- However, copyright law does not protect fundamental concepts, functions, and general features such as pull-down menus, colours, and icons.
- Under copyright law, copying a software program without making payment to the owner—including giving a disk to a friend to install on his or her computer—is a copyright violation.
- Not surprisingly, this practice, called **piracy**, is a major problem for software vendors.
- The global trade in pirated software amounts to hundreds of billions of dollars per year.

Software Attacks

Any type of computer can be targeted. For example, in September 2015 Apple Inc. removed several iPad and iPhone applications from its app store because they were stated as being infected by a virus.

These apps had all been developed in China using software tools that had “embedded malware.” Using Table 19.2, we could likely describe this malware as being a Trojan horse, back door, or logic bomb.

Table 19.2 groups software attacks into three categories:

1. remote attacks requiring user action,
2. remote attacks requiring no user action,
3. software attacks initiated by programmers during the development of a system.

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Type Description

1) Remote Attacks Requiring User Action

Virus Segment of computer code that performs malicious actions by attaching to another computer program.

Worm Segment of computer code that performs malicious actions and will replicate, or spread, by itself (without requiring another computer program).

Phishing Attack Attack that uses deception to acquire sensitive personal information by masquerading as official-looking emails or instant messages.

Spear Phishing Attack that targets large groups of people.

The perpetrators find out as much information as they can about an individual, tailoring their phishing attacks to improve their chances that they will

obtain sensitive, personal information.

2) Remote Attacks Needing No User Action

Denial-of-service attack An attack where an attacker sends so many information requests to a target computer system that the target cannot handle them successfully and typically crashes (ceases to function).

Distribution denial-of-service attack An attack where an attacker first takes over many computers, typically by using malicious software. These computers are called **zombies** or **bots**. The attacker uses these bots—which form a **botnet**—to deliver a coordinated stream of information requests to a target computer, causing it to crash.

3) Attacks by a Programmer Developing a System

Trojan horse Software programs that hide in other computer programs and reveal their

Alien Software

Alien software: is clandestine software that is installed on your computer through duplicitous methods.

The vast majority of pestware/alien software is **adware**—software that causes pop-up advertisements to appear on your screen.

Spyware: is software that collects personal information about users without their consent. Two common types of spyware are keystroke loggers and screen scrapers.

1. **Keystroke loggers**, also called **keyloggers**, record both your individual keystrokes and your web browsing history.

a. The purposes range from criminal—for example, theft of passwords and sensitive personal information such as credit card numbers—to annoying—for example, recording your Internet search history for targeted advertising.

2. **Screen scrapers**, or **screen grabbers**: software records a continuous “movie” of a screen's contents rather than simply recording keystrokes.

Spamware is pestware that uses your computer as a launch pad for spammers.

Spam: is an unsolicited email, usually advertising for products and services.

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designed behaviour only when they are activated.

Back door Typically a password, known only to the attacker, that allows him or her to access a computer system at will, without having to go through any security procedures (also called a **trap door**).

Logic bomb A segment of computer code that is embedded within an organization's existing computer programs and is designed to activate and perform a destructive action under specific conditions, such as at a certain time or date.

Cookies: are small amounts of information that websites store on your computer, temporarily or more or less permanently.

Tracking cookies, however, can be used to track your path through a website, the time you spend there, what links you click on, and other details that the company wants to record, usually for marketing purposes.

Supervisory Control and Data Acquisition Attacks

A SCADA is a large-scale, distributed measurement and control system.

SCADA systems are used to monitor or to control chemical, physical, and transport processes such as those used in oil refineries, water and sewage treatment plants, electrical generators, and nuclear power plants.

Essentially, SCADA systems provide a link between the physical world and the electronic world.

● SCADA systems consist of **multiple sensors, a master computer, and communications infrastructure.**

● The sensors connect to physical equipment.

○ They read status data such as the open/closed status of a switch or a valve, as well as measurements such as pressure, flow, voltage, and current.

■ They control the equipment by sending signals to it, such as opening or closing a switch or a valve or setting the speed of a pump.

○ The sensors are connected in a network, and each sensor typically has an Internet address.

○ If attackers gain access to the network, they can cause serious damage, such as disrupting the power grid over a large area or upsetting the operations of a large chemical or nuclear plant. Such actions could have catastrophic results.

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Cyberterrorism and Cyberwarfare

Cyberterrorism and cyberwarfare involve malicious acts in which attackers use a target's computer systems, particularly via the Internet, to cause physical, real-world harm or severe disruption, often to carry out a political agenda.

What Organizations Are Doing to Protect Information Resources

The Difficulties in Protecting Information Resources:

1. Hundreds of potential threats exist.
2. Computing resources may be situated in many locations.
3. Many individuals control or have access to information assets.
4. Computer networks can be located outside the organization, making them difficult to protect.
5. Rapid technological changes make some controls obsolete as soon as they are installed.
6. Many computer crimes are undetected for a long period of time, so it is difficult to learn from experience.
7. People tend to violate security procedures because the procedures are inconvenient.
8. The amount of computer knowledge necessary to commit computer crimes is usually minimal. As a matter of fact, a potential criminal can learn hacking, for free, on the Internet.
9. The costs of preventing hazards can be very high. Therefore, most organizations simply cannot afford to protect themselves against all possible hazards.
10. It is difficult to conduct a cost-benefit justification for controls before an attack

occurs because it is difficult to assess the impact of a hypothetical attack.

Another reason why information resources are difficult to protect is that the online commerce industry is not particularly willing to install safeguards that would make completing transactions more difficult or complicated.

As one example, merchant systems could demand passwords or personal identification numbers for all credit card transactions. However, these requirements might **discourage**

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people from shopping online. For credit card companies, it is cheaper to block a stolen credit card and move on than to invest time and money prosecuting cybercriminals.

And the final reason why information resources are difficult to protect is that it is extremely difficult to catch perpetrators. However, IT's About Business 19.3 shows that it is possible to catch attackers, albeit with great effort, time, and expense.

Risk

A risk: is the probability that a threat will affect an information resource.

The goal of risk management is: to identify, control, and minimize the impact of threats.

In other words, risk management **seeks to reduce risk to acceptable levels.**

Risk management consists of three processes:

1. Risk analysis
2. Risk mitigation
3. Controls evaluation

Organizations perform risk analyses to ensure that their IS security programs are cost-effective.

Risk analysis involves three steps:

1. Assessing the value of each asset being protected,
2. Estimating the probability that each asset will be compromised,
3. Comparing the probable costs of the asset's being compromised with the costs of protecting that asset.

The organization then considers how to mitigate the risk.

In risk mitigation, the organization takes concrete actions against risks.

Risk mitigation has two functions:

1. Implementing controls to prevent identified threats from occurring,
2. Developing a means of recovery if the threat becomes a reality.

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There are several risk mitigation strategies that organizations can adopt. The three most common are **risk acceptance, risk limitation, and risk transference.**

1. **Risk acceptance:** Accept the potential risk, continue operating with no controls, and absorb any damages that occur.
2. **Risk limitation:** Limit the risk by implementing controls that minimize the impact of the threat.
3. **Risk transference:** Transfer the risk by using other means to compensate for the loss, such as by purchasing insurance.

Finally, in controls evaluation, the organization identifies security deficiencies and calculates the cost of implementing.

If the costs of implementing a control are greater than the value of the asset being protected, **the control is not cost-effective.**

19.5 Information Security Controls

The purpose of **controls** or **defence mechanisms** (also called **countermeasures**) is to:

1. safeguard assets
2. optimize the use of the organization's resources,

3. prevent or detect errors or fraud.

These controls are designed to protect all of the components of an information system, including data, software, hardware, and networks. Because there are so many diverse threats, **organizations use layers of controls, or defence-in-depth.**

Controls are intended to prevent accidental hazards, deter intentional acts, detect problems as early as possible, enhance damage recovery, and correct problems.

- First comes the **control environment**,
- and then **general controls**,
- followed by **application controls**.

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The **control environment** encompasses management attitudes toward controls, as evidenced by management actions, as well as by stated policies and procedures that address ethical issues and the quality of supervision.

General controls apply to more than one functional area. For example, passwords are general controls.

Controls specific to one application, such as payroll, are **application controls**.

A typical payroll application control would be the approval of payroll wage rates.

- Information systems security encompasses all of the types of controls, as organizations need to have security policies and procedures, to protect all applications using physical and software controls such as antivirus or firewalls, and to protect individual applications with controls over how information is entered and managed.

Physical Controls

Physical controls prevent unauthorized individuals from gaining access to a company's facilities.

Common physical controls include:

1. Walls
2. Doors
3. Fencing
4. Gates
5. Locks
6. Badges
7. Guards
8. Alarm systems

More sophisticated physical controls include:

1. Pressure sensors
2. Temperature sensors

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3. Motion detectors

One shortcoming of physical controls is that they can be inconvenient to employees.

Access Controls

Access controls restrict unauthorized individuals from using information resources.

- Access controls can be physical controls or logical controls.
- Both types restrict unauthorized individuals from using information resources.
- Logical controls are implemented by software.

Access controls involve two major functions: **authentication and authorization**.

Authentication: confirms the identity of the person requiring access.

Authorization: determines which actions, rights, or privileges the person has, based on his or her verified identity.

Authentication

To authenticate (identify) authorized personnel, an organization can use one or more of the following types of methods:

1. **something the user is**
2. **something the user has**
3. **something the user does**
4. **and/or something the user knows.**

Something the user is, also known as **biometrics**, is an authentication method that examines a person's innate physical characteristics.

Something the user has is an authentication mechanism that includes regular identification (ID) cards, smart ID cards, and tokens

Something the user does is an authentication mechanism that includes voice and signature recognition.

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Something the user knows is an authentication mechanism that includes passwords and passphrases.

Passwords and Passphrases

All users should use strong passwords, which are difficult for hackers to discover. The basic guidelines for creating strong passwords are the following:

- They should be difficult to guess.
- They should be long rather than short.
- They should have uppercase letters, lowercase letters, numbers, and special characters.
- They should not be recognizable words.
- They should not be the name of anything or anyone familiar, such as family names or names of pets.
- They should not be a recognizable string of numbers, such as a social insurance number or a birthday.

A passphrase: is a series of characters that is longer than a password but is still easy to memorize.

Examples of passphrases are “maytheforcebewithyoualways” and “goaheadmakemyday.” A passphrase can serve as a password itself, or it can help you create a strong password.

Authorization

After users have been properly authenticated, the rights and privileges to which they are entitled on the organization's systems are established in a process called **authorization**.

A privilege (also known as user profile): is a collection of related computer system operations that a user is authorized to perform.

Companies typically base authorization policies on the **principle of least privilege:** which posits that users be granted the privilege for an activity only if there is a justifiable need for them to perform that activity.

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Communications Controls

Communications controls (also called network controls): secure the movement of data across networks.

Communications controls consist of:

1. Firewalls
2. anti-malware systems
3. whitelisting and blacklisting
4. Encryption

5. virtual private networks (VPNs)
6. transport layer security
7. employee monitoring systems.

Firewalls

A firewall is: a system that prevents a specific type of information from moving between untrusted networks, such as the Internet, and private networks, such as your company's network.

Firewalls range from simple, for home use, to very complex for organizational use.

- A **demilitarized zone (DMZ)** is located between the two firewalls.
- Messages from the Internet must first pass through the external firewall.
- If they conform to the defined security rules, they are then sent to company servers located in the DMZ.

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Anti-malware Systems

Anti-malware systems, also called antivirus, or AV, software: are software packages that attempt to identify and eliminate viruses and worms, and other malicious software (which is known as malware).

AV software is implemented at the organizational level by the IS department.

- Anti-malware systems are generally reactive.
- These systems create definitions, or signatures, of various types of malware and then update these signatures in their products.
- The anti-malware software then examines suspicious computer code to determine whether it matches a known signature.
- If the software identifies a match, then it removes the code.
- For this reason, organizations regularly update their malware definitions using online updates.

Whitelisting and Blacklisting

Whitelisting: is a process in which a company identifies the software that it will allow to run on its computers.

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Whitelisting permits acceptable software to run, and it either prevents any other software from running or lets new software run only in a quarantined environment until the company can verify its validity.

Whereas whitelisting allows nothing to run unless it is on the whitelist, **blacklisting** allows everything to run unless it is on the blacklist. A blacklist, then, states which types of software are not allowed to run in the company environment.

Encryption

Encryption: is the process of converting an original message into a form that cannot be read by anyone except the intended receiver.

All encryption systems use a key, which is the code that scrambles and then decodes the messages. The majority of encryption systems use public-key encryption.

Public-key encryption—also known as asymmetric encryption—uses two different keys:

1. a public key
2. private key

The public key (locking key) and the private key (the unlocking key) are created simultaneously **using the same mathematical formula or algorithm.**

Because the two keys are mathematically related, the data encrypted with one key can be decrypted by using the other key.

Organizations that conduct business over the Internet require a more complex system. In these cases, a third party, called a **certificate authority**, acts as a trusted intermediary between the companies.

The certificate authority issues digital certificates and verifies the integrity of the certificates.

A digital certificate: is an electronic document attached to a file that certifies that the file is from the organization it claims to be from and has not been modified from its original format.

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Virtual Private Networking

A virtual private network (VPN) is: a private network that uses a public network (usually the Internet) to connect users.

VPNs essentially integrate the global connectivity of the Internet with the security of a private network and thereby extend the reach of the organization's networks.

VPNs have several advantages:

1. First, they **allow remote users to access the company network**.
2. Second, they **provide flexibility**.
 - a. That is, mobile users can access the organization's network from properly configured remote devices.
3. Third, **organizations can impose their security policies through VPNs**.
 - a. For example, an organization may dictate that only corporate email applications are available to users when they connect from unmanaged devices

To provide secure transmissions, VPNs use a process called **tunnelling**.

Tunnelling: encrypts each data packet to be sent and places each encrypted packet inside another packet.

Transport Layer Security

Transport layer security (TLS), formerly called secure socket layer: is an encryption standard used for secure transactions such as credit card purchases and online banking.

TLS encrypts and decrypts data between a web server and a browser end to end.

TLS is indicated by a URL that begins with "https" rather than "http," and it often displays a small padlock icon in the browser's status bar.

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Employee Monitoring Systems

These companies are implementing employee monitoring systems, **which scrutinize their employees' computers, email activities, and Internet surfing activities**.

These products are useful to identify employees who spend too much time surfing on the Internet for personal reasons, who visit questionable websites, or who download music illegally

Application Controls

Application controls, as their name suggests, are security countermeasures that protect specific applications in functional areas.

They can be automated or performed by people. Application controls fall into three major categories:

1. **Input controls:** are programmed routines that edit input data for errors before they are processed.
2. **Processing controls:** are programmed routines that perform actions that are part of the record-keeping of the organization, reconcile and check transactions, or monitor the operation of applications.

3. **Output controls:** are programmed routines that edit output data for errors, or help to ensure that output is provided only to authorized individuals.

Business Continuity Planning, Backup, and Recovery

Business continuity planning: is the chain of events linking planning to protection and to recovery.

The purpose of the business continuity plan is to provide guidance to people who keep the business operating after a disaster occurs.

- Employees use this plan to prepare for, react to, and recover from events that affect the security of information assets.

- The objective is to restore the business to normal operations as quickly as possible following an attack.

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- The plan is intended to ensure that critical business functions continue.

In the event of a major disaster, organizations can employ several strategies for business continuity. These strategies include hot sites, warm sites, cold sites, and off-site data storage.

- **A hot site:** is a fully configured computer facility with all of the company's services, communications links, and physical plant operations.

- A hot site duplicates computing resources, peripherals, telephone systems, applications, and workstations.

- **A warm site:** provides many of the same services and options as the hot site.

- However, it typically does not include the actual applications the company needs.

- A warm site includes computing equipment such as servers, but it often does not include user workstations.

- **A cold site:** provides only rudimentary services and facilities, such as a building or a room with heating, air conditioning, and humidity control.

- This type of site provides no computer hardware or user workstations.

Hot sites reduce risk to the greatest extent, but they are the most expensive option.

Conversely, cold sites reduce risk the least, but they are the least expensive option.

In addition to hot, warm, and cold sites, organizations also use off-site data storage services.

Off-site data storage: is a service that allows companies to store valuable data in a secure location geographically distant from the company's data centre.

Information Systems Auditing

An audit: involves the accumulation and evaluation of evidence that is used to prepare a report about the information or controls that are being examined, using established criteria and standards.

An information systems audit: is an examination of information systems, their inputs, outputs, and processing.

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It can also include an assessment of the efficiency and effectiveness of the system.

Types of Auditors and Audits

There are several types of auditors and audits.

External auditors, also referred to as independent auditors, work at a public accounting firm, auditing primarily financial statements.

Government auditors work for the provincial or federal auditors' general offices.

Specialist auditors can be from a variety of fields. Information systems auditors, for example, may work for any of the above organizations, and may have a Certified

Information Systems Auditor (CISA) designation.

IS auditing is usually conducted as part of the controls evaluation for the financial statement audit or as part of internal auditing, which looks at the efficiency or effectiveness of systems.

Auditing focuses on topics such as:

1. Operations
2. data integrity
3. software applications
4. security and privacy
5. budgets and expenditures
6. cost control
7. productivity

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Yes, this is my first time with SOS Tutoring

No, I have taken other course with SOS Tutoring

2. What are the top 3 ways you hear about SOS Tutoring Courses? (Order from 1 to 3, one being most often)

Flyers ____ Speech ____ Posters ____ Sponsored Events ____ Friends ____

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If you heard about us in other ways, please write in here: _____

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If you would like to hear from us in other ways, please write in
here: _____

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Yes

No

If yes, what are your top 3 reasons why? (Order from 1 to 3, one being most important)

Price _____ Reputation _____ Better Schedule/Shorter Courses _____ Quality of Tutor _____

Association with school/student group _____ SOS Doesn't Offer Course _____

If you have another reason, please write in
here: _____

Email: _____ **(optional - for contest only)**

Faculty: _____ **Year of Study:** _____ Undergraduate Continuing
Education

Course Received Via: On Campus Instruction Distance Education

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5. How many crash courses/reviews have you taken with these companies in the past?

Of Courses

Top Flight Tutorials _____ Prep 101 _____ Gradesaver _____ A Plus Tutorials _____

If you've used another crash course company, please write in their name and the # of courses taken.

Name: _____ # Of Courses: _____

Name: _____ # Of Courses: _____

Name: _____ # Of Courses: _____

6. When considering an SOS Crash Course, what are the top 3 reasons you take SOS over the competition?

(Order from 1 to 3, one being most important)

Price _____ Reputation/Word of Mouth _____ Fits Schedule Better _____ Quality of Tutor _____

Referral by a Friend _____ Only Company Offering Course _____

If you have another reason, please write in
here: _____

**7. What are the top 3 most important areas where SOS can make improvements?
(Order from 1 to 3, one being most important)**

Tutors _____ Course Packages _____ Customer Service _____ Exam Level Questions _____

Difficulty level _____ On Campus Presence _____ Registration Process _____

Course Knowledge _____ No Improvement Needed _____

If you have another improvement, please write in here: _____

8. What was the main reason for taking this crash course today?

I missed too many classes & need help to understand

I attended class but it was difficult to understand

I understand but would like a general review

I understand but would like to practice exam style questions

If you have another reason, please write in here: _____

9. What is the most important part of a crash course?

Tutor

Course Package

Exam Level Questions

Tutor's Knowledge of Course

If you feel something else is more important, please write in here: _____

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Chapter 1

INFORMATION SYSTEMS AND YOU

Information Systems Defined

- System: A **group of components** that **interact** to achieve a **purpose**
 - Not necessarily technology-related (e.g. a tree is a system, so is a human)
 - When the system's PURPOSE is to create information, it then becomes an information system
 - Still not necessarily technology-related (e.g. market researchers going door-to-door and consolidating results on paper without ever using a computer)
 - This was the reality before computers – information systems still existed!
- Computerized Information System
 - An information system that is enabled by technology
 - What we commonly associate with MIS in business today
 - Consist of 5 components

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The 5 Components Explained

Hardware All electrical components of the system Computer, Cables, phones

Software Programs and application that are part of
the system

Microsoft Office, Adobe Photoshop,
MyConcordia

Data Facts and statistics collected to form
information

Sales revenue, grades in school,
temperature

Procedures Instructions or steps followed to achieve an
outcome

How to turn on a computer,
how to write an essay

People The humans using or interacting with the
system (both directly and indirectly)

DIRECT USERS”

Programmers, employees inputting data,
someone who logs in

INDIRECT USERS:

Manager who receives a system-generated
report (didn't physically use the
system themselves)

IT vs. IS

Included Components • Hardware

- Software
- Data
- Hardware

- Software
- Data
- Processes
- People

The Difference Raw Technology Gives IT a purpose

Example Just a computer A computer that is used by a manager (people), to generate monthly sales

forecasts (process)

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What is MIS?

- Using technology to achieve strategic business goals and objectives
- Created to solve a business problem or optimize the business in some way

Example: Developing a website for the sake of having one doesn't solve anything

- Always ask yourself, what is the company's need • the system should address it
- *The newest, biggest, shiniest system will not always solve the issue!*

Think of IS as a tool used to accomplish organizational goals

Information Systems + Canadian Economy

- Referred to as the Information and Communications Technology (ICT) sector
 - Provides IT and IS services to businesses
 - Growing industry in Canada (9.5% of GDP from 2002-2012)
- Compared to other industries:
 - Higher proportion of ICT workers has university degrees (44.4%)
 - Higher paid than average salary (over 65,000\$ average)
 -

Information Systems + Business Professionals

- It's not enough to know how to use technology to stand out
- Communication and business skills are key, even in MIS
- Types of jobs:
 - Business analyst
 - IS Consultants
 - Computer and IS manager
 - User-support technicians

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Moore's Law

- The density of circuits on electronic chips is doubling every 18 months or so which leads

to...

1. Computer speed is increasing exponential (not at a stable rate every 18 months, but it is

continuously increasing)

2. The cost for a given computing speed decreases exponentially

3. Data storage and data communication costs virtually 0\$

4. Routine tasks can be outsourced cheaply – if your job can be automated, your job isn't

secure

- **Key points**

- Created by: Gordon Moore, founder of Intel, in 1965

- Not a real law - A prediction that has become reality

Trends in IT

1. Network Effects (Lock-In) The value derived from technology increases as more people use it.

*** IMPLICATION: User

Adoption is the key to driving value in IT.

Facebook

Google+

2. Shrinking Device Size Due to Moore's Law, we can fit a lot more power into much smaller devices.

Smartphones

3. Ubiquity Technology is everywhere in our lives.

Your smartphone, tablet, and

laptops are all in-sync and available
anywhere, all the time.

4. Location-Based Services We can locate people wherever
they are.

GPS

Shopping on your phone

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Practice Problems

1. Which of the following is NOT TRUE about Murphy's Law?

- a) Density of transistors on a given microchip increase every 18 months or so
- b) Computer speed increases every 18 months
- c) Costs of computers decreases as density on microchips increase
- d) Murphy's law is a prediction but not a real law founded on science

2. _____ cost(s) virtually 0\$.

- a) Hardware
- b) Microchips
- c) Communication Technology
- d) Data Storage

3. Moore's Law has resulted in some jobs becoming obsolete. Which of the following
skills

would not be impacted by Moore's Law when it comes to job security here in
Canada?

- a) Programming skills
- b) Statistics computation skills
- c) Business analysis skills
- d) Assembly line skills

4. You go on a shopping spree at your favourite clothing store. The clerk hands you
the machine

so that you can pay with your credit card. The machine she hands you is an example
of:

- a) Software
- b) Hardware

- c) People
- d) Process

5. When you are handed a copy of your receipt at your local Starbucks, you are becoming the

following part of the information system used for the transaction:

- a) Direct User
- b) Indirect User
- c) Data
- d) Output

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6. Which of the following is a valid reason for a company to develop a new information system?

- a) All of its competitors have new systems
- b) New industry standards recommend the new system
- c) To make you produce your products at a lower cost
- d) Because it's being offered by the supplier at a discount

7. Which of the following components distinguish a computerized information system but not involved in information technology?

- a) Direct Users
- b) Data
- c) Hardware
- d) Software

8. Some airlines offer Wi-Fi on long-haul flights meaning passengers can now use their laptops

on board. As a result, major online retailers can now promote their online shopping experience to you while cruising at 35,000 feet in the air. This represents which IT trend?

- a) Shrinking Device Size
- b) Network Effects
- c) Moore's Law

d) Ubiquity

9. The recent trend of network effects in IT implies that:

- a) Networks are getting more powerful over time
- b) People are able to communicate virtually due to new tools becoming available
- c) New technology becomes more useful as more and more people start using it
- d) Everyone is connected to the Internet using networks

10. In recent years, the ICT industry in Canada has grown significantly relative to other sectors.

The industry can be defined as _____ compared to other industries.

- a) Having a higher number of younger workers
- b) Having a higher number of university graduates
- c) Being promoted more rapidly
- d) Being more satisfied in the work they do

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11. Mark works for a manufacturer of electrical components for cars. Every day, he in charge of

going down to the factory floor and taking note of the number of parts that are being produced at each station throughout the day. He fills in a form on his clipchart and hands it in

at the end of day to his manager. Mark's work would be considered a(n):

- a) Computerized Information System
- b) System
- c) Information System
- d) Business Analyst

12. MIS professionals are most likely found at the heart of the following departments within a business:

- a) Programmers and software developers
- b) Programmers and the marketing department
- c) Marketing and Accounting
- d) Human resources and the recruiters

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Chapter 4

HARDWARE AND SOFTWARE

The Past

• Key Conclusions

1. Price and Performance relationship: Moore's Law
2. Shrinking Device Size: Over time, devices have been getting smaller and smaller
3. Networking Is Key: Cheaper and easier to join

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Hardware

- All the raw electrical components of an IS system (one of the 5 components in chapter 1)
- Despite changing technology, all computers consist of these components.

Collect data provided by
the user; make requests
to the computer

Yes • Physical properties
(size, number of
buttons, etc.)

- Usage specific
(resolution, speed of
input, etc.)

Keyboard, touch screen,
barcode scanner,
microphone, camera

Manipulates the data;
performs logic
and calculations

No • Speed and
performance

CPU, RAM

(see details below)

Provide requested
information to the user
and show results

Yes • Output Quality (printer
resolution, pages per
minute, etc.)

Printer, computer screen,
speakers

Saves data and programs
for future use by
the computer

No • Volume (how much
can be stored)

• Reliability

USB keys, magnetic tapes,
hard drives

The CPU

- The brain of the computer
- Performance measured in Hertz (Hz) – and kilohertz, megahertz, up to gigahertz today
- Compared based on: Speed, function, cost
- Part of the **PROCESSING** component of Hardware
- Costly investment and research needed for CPU makers to compete

Storage

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RAM vs. ROM

Full Name Read-Only Memory Random Access Memory

Memory State Permanent (NON-VOLATILE) Temporary (VOLATILE)

Purpose Start the computer Run programs when the computer is on

Speed Adding ROM has little impact on processing speed

Adding RAM lets you do more things at the same time

Human Example VITAL FUNCTIONS - breathing doesn't need to be thought about – your body just does it

DAILY ACTIVITIES - you can listen to music, study, and chat on Facebook at the same time... but then try also cooking and working out at the same time; your brain can't process that many tasks at the same time. When you go to sleep, you stop doing all those activities!

- ROM is what allows a computer to start.
 - The instructions that explain to the CPU how to start are stored here because they don't need electricity to be remembered.
- RAM is erased when it loses electricity.
 - This why you need to re-open Firefox, Word, Excel and other programs when you reboot.

How does it all fit together?

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Measuring Computer Data

- A Computer talks to its different parts, as well as with itself, in binary code
 - Binary code consists of 1's and 0's
 - It is incomprehensible to humans – that's why we have programming languages.
 - Each 1 or 0 = 1 bit
 - Bits are organized into groups of 8, called BYTES • 8 BITS = 1 BYTE

Example of a byte: 01101001

- Each character is represented by a BYTE
- 1 Kilobyte is **1024 BYTES**, NOT 1000 like in other measurements (example: 1000 grams = 1 kilogram)

Name Size Examples

Kilobyte (K) 1024 BYTES Small files

Megabyte (MB) 1024 KILOBYTES Small programs, files, photos, etc.

Gigabyte (GB) 1024 MEGABYTES Large programs, files, photos, etc.

Terabyte (TB) 1024 GIGABYTES Modern hard drives

Petabyte (PB) 1024 TERABYTES Used in large businesses, not in our personal computers

Software

1. OPERATING SYSTEM (OS): Controls the computer's resources

Examples: iOS, Android, Windows, Mac OS, Linux, etc.

2. APPLICATION SOFTWARE: Allows the user to perform a specific task

Examples: Shazam, Calendar applications, Instagram, Facebook Messenger, Microsoft Office, Adobe Acrobat

Application Software is made to run on certain operating systems.

Example: Apple software, such as Keynote and Pages, cannot be run on a Windows operating system.

Operating Systems are made to run on certain types of hardware.

Example: You need an Apple phone to run iOS.

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Name	Description	Typical Users/User Fields	Notes

Windows	Most popular OS in the world with over 85% of computers running it	Everyone	Also used for servers in businesses

Mac OS	Developed by Apple	Everyone	(less in businesses) Used almost exclusively for arts and graphics before 2006 when it gained widespread popularity

Unix	Powerful OS developed in the 1970s by Bell Labs	Science and engineering	Very complex and difficult to use

Linux	A version of UNIX that is free for users and developed by an opensource community **	Engineering, computer science, servers	Used mostly on server computers (popularized by IBM)

****NOTE:** Open-source means that the software was developed by a community of programmers who volunteer their time to develop it. It is often free and is maintained entirely by the community.

Category Description Examples

Horizontal Market Apps Applications used across all organizations and industries

Word, Excel, Paint, Photoshop

Vertical Market Apps Applications designed for specific organizations and industries

Hotel software, accounting programs

One-of-a-kind Apps Applications designed for a very specific purpose

Software used by Canada Revenue Agency

- **WEB BROWSERS:** Software that enables you to access the Internet

Examples: Firefox, Chrome, Safari, Internet Explorer

- A combination of Application Software and OS

- **Licensing vs. Owning Software**

- When you buy a copy of Windows or Mac OS, you **DO NOT** own it
- You are provided with a license, the rights to use the program
- Windows and Apple respectively still own the software
- They can technically withdraw your rights to use their program at any time

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- **FIRMWARE:** Software that is installed into devices (examples: printers, keyboard, etc.)

- All devices have bits of software (firmware) inside to help it talk with the computer
- It is **Software for the Hardware** (instead of for the user)
- Helps the device turn itself on
 - For computers, this program is called **BIOS (Basic Input/Output System)**
 - Goes into the ROM (see above) and runs the instructions that turn the computer on

Computers Interacting

- **CLIENT:** The local computer that you use

- Run programs that the user needs (examples: Word, Photoshop)

- **SERVER:** A computer physically located elsewhere that provides your computer with a service
 - Includes all programs that you access over the Internet (email, Facebook)
 - Much faster, larger, and costly than clients
 - Can also be a collection of computers running the program (**SERVER FARM**)
- **CLOUD COMPUTING:** The SERVER computer is not owned by those running the program
 - A certain space is rented
 - The Network in the middle is usually the Internet
 - Based on the concept of **GRID COMPUTING**, meaning lots of computers are used to address a single problem (in this case, provide a service)

Examples: Facebook, Gmail, Amazon, YouTube

- **Thin vs. Thick Client Software**

- **THIN CLIENT:** All you need to access the server is a Web Browser

Example: Facebook, Gmail

- **THICK CLIENT:** Programs other than a web browser are needed to access the server

Example: Outlook 2010 (you need a web browser and the MS Outlook program installed

on your computer to use it)

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Computer Security 101

- **VIRUS:** A computer program that spreads across your computer doing unwanted things
 - Unwanted things include deleting your programs, sending files and emails
 - **PAYLOAD** is the code that causes the unwanted activity
 - Human Analogy: Cancer, it keeps spreading until it consumes all resources
- **MACRO-VIRUS:** Viruses that attach themselves to documents
 - Starts the malicious activity when you open it

Example: Downloading an infected Word file

- **WORM:** Viruses that spread over the Internet

- They are made to spread across computers
- An infected computer is called a **ZOMBIE** computer
- A group of zombie computers is called a **BOTNET**

• **Preventing Viruses:**

1. **PATCHES:** Program makers find holes in their programs that let viruses in, then modify the code to prevent this from happening

- Solution: Update your computer frequently

2. **ANTIVIRUS SOFTWARE:** Scans your computer for viruses and gets rid of them

- Solution: Make sure you have one

Why does this matter to business managers?

- Managers must know what their employees need to accomplish their daily tasks:
 - How fast should the computer be?
 - Which programs are needed to accomplish the tasks?
 - Which programs on the server does my employee need to access?
- They must understand how computers work so that they can communicate with the IT department.
- Most hardware and software are standardized in businesses

Example: Everyone uses Windows, so Mac OS isn't usually an option in most businesses

just because a client wants to use it.

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Chapter 3

PRODUCTIVITY, INNOVATION AND STRATEGY

Productivity and Technology

- **PRODUCTIVITY:** Dollar value generated by a Canadian worker in 1 hour
 - Canadians are about 20% less productive than Americans are.
 - The ICT industry provides technology to make you work smarter.
 - There is no link between having a computer and productivity.
 - This is referred to as the **PRODUCTIVITY PARADOX**
 - It's not about having a computer; it's about how we use it.
- **IT Value:** The benefit derived from technology when it's used

1. FOR A COMPANY: Create more or better output

Example: Automating the manufacturing process of clothing makes the process faster

2. FOR AN INDUSTRY: Changes industry dynamics and competition

Example: iPods killed CDs, CDs killed cassettes

3. FOR A CUSTOMER: End-user benefits from better product

Example: Computers are getting cheaper but are of higher quality

** This is why BTM (Business Technology Management) was created:
to drive technology innovation in Canadian businesses **

Efficiency vs. Effectiveness

- **EFFICIENCY:** Doing the same old thing, but quicker or with fewer resources

- “Doing things right”

Example: Replacing workers making cars with automated machines

- **EFFECTIVENESS:** Doing something new or improving what you do to better meet the

customer’s needs

- “Doing the right things”

Example: Finding features for the iPhone that user wants

** Businesses need to find the balance between the two **

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Value Chain Analysis

- Formalized by Michael Porter (Harvard University)

- Looks internally (within the company)

- Different for each business (depends on their processes)

- **PRIMARY ACTIVITIES:** The activities involved with providing a product or service

- **SUPPORT ACTIVITIES:** The activities that support the primary ones

- The background stuff that helps the business run (**example:** finances, hiring, tech support, etc.)

Porter’s Four Competitive Strategies

- Companies can adopt one or several of these strategies to compete

- Company goals, culture, and activities must be in line with the chosen strategy

Providing low-cost products
targeting all consumers

- Wal-Mart, Dollarama

Providing unique products
targeting all consumers

- Coke, FedEx

Providing low-cost products for a
specific customer

- Forever 21

Providing a unique product for a
specific type of customer

- Ferrari, Canada Goose

Inbound

Logistics Operations Outbound

Logistics

Marketing

& Sales Service

Firm Infrastructure

Human Resources

Technology Development

Procurement

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Porter's Five Forces Model

- Defines the industry structure
- Shows if an industry is attractive or not

RIVALRY

New

Entrants

Power of

Buyers

Threat of

Substitutes

Power of

Suppliers

Innovation and IT

- **SUSTAINING TECHNOLOGIES:** Regular improvements on what we're doing

Examples: Faster smart phones, longer battery life

- **DISRUPTIVE TECHNOLOGIES:** New products or services that drastically change our environment

Examples: The iPhone when it first came out

- Can completely change industries (examples: Phones were forever changed after the iPhone was

released; banking was forever changed once ATMs were invented.)

- Can completely destroy industries (example: CDs died after the iPod came out)

- **DIFFUSION OF INNOVATION:** The steps a person takes in adopting new technology

Competitive Advantage

- Organizations that do something that allow them to outperform competitors

Product and Services Business Processes

1. Make something new
2. Improve what you're currently offering
3. Differentiate what you're offering
1. Lock in customers and buyers*
2. Lock in suppliers*
3. Make it harder for new companies to enter the market/industry
4. Partner with others
5. Reduce costs

* Locking in stakeholders can be done by increasing **Switching Costs**, the costs (monetary or otherwise)

involved in switching from one company to another (example: Apple has everything integrated)

Knowledge Persuasion Decision Implementation Confirmation

Sustaining the Advantage with IT

- Technology can start by giving you an advantage, but companies quickly copy.
- The more common technology is, the less of an advantage it is.

Example: Word processing software is now just needed, it doesn't make you different.

Sustaining the Advantage with IS

- Information Systems (IS) include processes and people, which can't be easily copied.
- It's all about how you use the technology.

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PS&I Chapters 2 and 5

BUSINESS PROCESSES

Processes

- **BUSINESS PROCESS:** A sequence of activities that serve to accomplish something.

Example: Taking orders at Tim Hortons

Example: Making sandwich at Tim Hortons

- **ACTIVITY:** The tasks involved in completing a business process

Example: When making the sandwich, the tasks include adding chicken, cutting bread, toasting, etc.

Why Standardize Processes?

- 1 Enforce Policy** Having a standard way of doing things lets Starbucks enforce rules
- 2 Consistency** Starbucks quality is the same everywhere due to standard processes
- 3 Scalable for change** If we make a new drink at Starbucks, we have a base for how to make it
- 4 Reduces Risk** Less likely to mess up your drink since there's a set way of making it regardless of which employee is working

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Business Process Model & Notation (BPMN)

- A standard for communicating businesses processes in visual, human terms

- **ROLE:** A category of activities within the process performed by an actor (e.g. cashier)

- **ACTOR:** A **human** or **computer** that accomplishes certain tasks

Example: Taking an order includes several sets of activities... the cashier takes the order and

deals with payment, the employee putting together your order has their own set of activities

(e.g. get donut, make coffee, etc.)

- **SWIMLANES:** All of the activities in one role (thus for one actor)

- Can be drawn horizontally or vertically

ACTIVITY

ACTIVITY

The + sign indicates
there is a sub-process
documented elsewhere

+

DATABASE

FLOW OF THE PROCESS

FLOW OF DATA

(write what data is flowing on
the dotted line – e.g. ORDER
or CREDIT CARD NO.)

START OF PROCESS

END OF PROCESS

DECISION Generally a YES or NO

NOTES WITHIN

THE DIAGRAM

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SOS Step Box

STEP 1: Read the case and list all the roles in your case.

STEP 2: Re-read the case and this time list all the activities for each role. Then, re-read the

case again and list all the decisions that are made by each actor.

STEP 3: Draw a column for each role with that role's name at the top of the column.

STEP 4: Place all activities and decisions in your columns (swimlanes) based on the lists

your made.

STEP 5: Draw the PROCESS and DATA flows. Don't forget to label your data flows.

STEP 6: Draw the START and STOP point

Example CASE 1 – Future Shop Home Delivery

Map the following case using a business process model and notation (BPMN).

1. A customer enters Future Shop and places an order for home delivery
2. The cashier enters the order in the system (called Order OS).
3. If the customer is new, a profile must be created in Order OS. In this case, the cashier takes down all customer information (address, telephone, email). If it is a returning customer, the order proceeds as normal and is placed into the system.
4. The cashier processes the payment.
5. Order OS sends a message to a packer in the central warehouse with details about what to package and where to send it. The packer assembles the order.
6. The order is given to a truck driver who is automatically sent a receipt from Order OS with the delivery details. The driver hands the package directly to the customer.

Draw your BPMN and be sure to label everything accordingly.

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NOTES

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Structured vs. Dynamic Processes

- STRUCTURED PROCESSES: Formal activities that don't change from day-to-day

Example: Making a coffee at Tim Hortons – one way of doing it properly

- DYNAMIC PROCESSES: Informal activities that aren't always done the same way

Example: A sales rep at Future Shop – the experience differs depending on customer needs

Category Structured Dynamic

Many – there's one way of doing things Few – more relaxed

Not necessary Very necessary

Procedures are enforced by the

company

Must adapt as you go

Very important – save time & money Less important, more strategic

Data vs. Information

- DATA: Recorded facts and figures

Example: Number of houses on a street, number of tickets sold

Accurate Timely Relevant Sufficient Cost

Must be able to rely

on what comes out

of systems

Need it in a timely

fashion to make

decisions

Must be usable in

the decision at hand

You need enough

to make proper

decisions

Data is expensive –

think of surveys or

the census!

- INFORMATION: The knowledge we gain from interpreting those facts (data), provides meaning
 - When you sort, process, or interpret data, it becomes information – becomes meaningful
 - The MEANING of information differs from one person to the next

Example: 25 degrees outside is hot for me, but might be just right for you

Data vs. Information using Examples

Temperature Temperature taken each day Organized by day over 5 years to see annual trends

Sales Revenue generated each day Revenue generated yearly compared over 3 years

Population # of students at Concordia Change in enrollment over the past 3 years

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Types of Processes in Organization

Strategic Solving broad, organization-wide issues, direction of company. Often made by executives

- New product lines
- New menu items
- Outsourcing

Managerial Planning, analyzing, and managing resources in order to meet objectives

- Schedule maintenance
- Inventory Management
- Financial Statements

Operational Day-to-day tasks with structured processes that focus on efficiency (i.e. front-line staff)

- Customer Service Agents
- Bookkeeping
- Software testing
- Each activity in the **VALUE CHAIN** (chapter 4) has processes from EACH level above
- Systems play a role in business processes (automation, recording, data storage)

Strategic

Processes

Managerial

Processes

Operational Processes Transaction Processing System (TPS)

Management Information Systems (MIS)

Executive Support Systems (ESS)

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Process Improvement

Example – McDonalds

- **OBJECTIVE:** Serve customers faster than any other fast food chain
- **METRIC:** Customer served in less than 45 seconds

***** Process improvement is about changing the way we do things to better meet our objectives *****

How? Examples

Improve Activity • Grills that heat up and cook faster

- Fries made in major batches

Improve Data Flow • Screens that show cooks the order as its placed

- Tracker that sends message to manager when stock is low

Improve Control • Burgers come with pre-chosen toppings instead of letting customer customize it

Improve Procedures • 1 person grilling, 1 person assembling instead of the same

- More training so employees work faster

Automation • Timers turn deep fryers on and off

- Drinks fill themselves to the right level
- BOTTLENECK: When an activity slows down the whole process

Example: We can't keep producing clothes 24/7 because fabric delivery is too slow

Using BPNM Diagrams for Improvement

- As-is diagrams: The way the process currently looks
- Out-to-be-diagrams: How the process looks once its improved and re-mapped

Objectives

- Defined by management
- Must be properly communicated

Measures/Metrics

- How are we doing at meeting the objectives set?
- Indicates performance

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PS&I Chapters 6 & 7

ERPs and SAP

What are ERPs?

- ENTERPRISE RESOURC PLANNING (ERP): A system that centralizes data
- Prevents INFORMATION SILOS (when data is stored in separate systems)
 - If not prevented, departments work in isolation
- Since the ERP comes with processes, the organization must change the way it does things

- These processes are called INHERENT PROCESSES or PROCESS BLUEPRINTS
- GAP ANALYSIS: Uncovering differences between business needs and ERP's ability

When ERPs are too expensive...

- ENTERPRISE APPLICATION INTEGRATION (EAI): Provides software that allows the separate databases to communicate with each other

- Enables communication
- Departments maintain their own data but it can be integrated as needed
- Allows companies to gradually move to ERP

ONE Database

Integrated, industry-leading
processes needed to use the
system

EAI

Server

Accounting

Sales

HR

Operations

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Elements of an ERP

Integrated throughout all of the company's activities (value chain)

- Each function (the ovals) is called a MODULE
- ERPs were developed over time
 - Started with Materials Requirement Planning (MRP) then made its way through the value

chain to integrate the whole business

- Originally started in manufacturing companies
- Involves all 5 components of an IS:

- Purchase needed computers, servers, printers, network devices, etc.
- On-the-cloud of physical system?

- CONFIGURATION: The setup of the system on the company's computers

- CUSTOMIZATION: Modifications to the ERP to meet specific needs
 - Big empty databases that need to be converted.
- Old data needs to be moved into it

Company chooses which ERP processes. It then must change its old way of doing things.

Includes the following people:

1. Users
2. Systems Analysts
3. Consultants from the vendor or a third-party

Inbound

Logistics Operations Outbound

Logistics

Marketing

& Sales Service

Purchasing

Materials

Management

Production and

Manufacturing Sales and

Distribution

Customer Relationship

Management (CRM)

Financials and

Costs

Human

Resources

Asset

Management

SUPPORT ACTIVITIES

also have modules

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Types of Data in an ERP

1. TRANSACTIONAL DATA: Day-to-day data collected from operations, changes by transaction

Example: Sales made, items purchases

2. MASTER DATA: Data that doesn't change between transactions

Example: Supplier names, addresses

3. ORGANIZATIONAL DATA: Data about the company

Example: Locations, warehouses, financial accounts

Benefits of ERP

- 1** Suppliers are integrated Your system can talk with the supplier's system
- 2** Access to more data for managers Managers from around the world can see statistics
from divisions around the world
- 3** No more silos Marketing can collaborate with operations since all data is together
- 4** Data is shared in real-time When an update is made in the production in China, managers in the US can see it right away
- 5** Integrated processes based on best practices The processes that come with the ERP are based
on optimal ways of doing things

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Implementation Challenges

Decision Example

Vendor Selection SAP, Oracle, Microsoft??

Gap Analysis Which modules do we integrate, which do we not? Do we customize?

Configuration The rules – Order sizes, who approves new orders, who modifies

Data Issues The way we stored data in our old databases may not be same as the ERP

Cutover Process When and how do we switch to the new system?

Category Challenge Example

Management Not supporting it throughout Management says “go, implement it” then doesn't

ask for updates on progress

Oversell benefits ERP will not change the world, it's not the solution to all company problems

Ignores Cultural Resistance The way work is done will change – people need to be made aware of this

Team Lack of Collaboration The wrong configuration is set up because the end users are not consulted on their needs

Individual Users don't see benefit Using the new system makes it longer for me to place an order

What types of Organizations use ERP?

- **INDUSTRY:** Used across all industries
- **COMPANY SIZE:** Used by large organizations with revenues above 5 million
 - Smaller companies don't need massive software
 - May not have the IT resources to implement it
- **COUNTRY:** Used around the world and in multi-national companies
 - **SINGLE INSTANCE:** for the whole company around the world
 - **MULTIPLE INSTANCES:** different installation in different regions

Company Hierarchy

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ERP Vendors

- Smaller vendors focus on niche markets (e.g. advertising agencies, small companies, cloud)

SAP

- Built in Germany founded in 1972
- Used by more than 80% of Fortune 500 companies
- First ERP designed to work at multiple companies
- Most popular version is **R/3** • rebranded as SAP Business Suite
- Runs on **NETWEAVER**, the operating system for SAP
- **ABAP** is the programming language for SAP customization

Gold standard

22% market share

High-quality

technical staff

15% market share

All modules are
acquired smaller
companies
10% market share

Then configured based on needs of

the specific company

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Procurement Concepts

- **PROCUREMENT:** The process of acquiring goods and services from suppliers

Example: Raw materials, machines, parts, ingredients

- **PURCHASE ORDER (PO):** A document that requests the delivery of a product + the quantity

- **RAW MATERIALS INVENTORY:** Stock of materials used to make our core product

Example: Starbucks – How much sugar do we have left, how many coffee beans

- **SUPPLIER RELATIONSHIP MANAGEMENT (SRM):** Interaction between supplier and company

- Automated with the use of ERPs

Example: Automatically place order for more coffee beans when we have less than 5 bags

- **RETURNS MANAGEMENT PROCESS:** Getting defective products back to the supplier

- **SUPPLIER EVALUATION PROCESS:** Adding, removing, and approving new suppliers

- **BULLWHIP EFFECT:** When a company orders more products than needed

- Caused by a sudden change in demand

Other Concepts

- **TRAIN THE TRAINER:** The vendor trains super users, who then train others below, and so on

- Reduces costs of training

- **ACCESS CONTROLS:** Which parts of the ERP a user can access

Inbound

Logistics Operations Outbound

Logistics

Marketing

& Sales Service

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Chapters 5, 5a, 5b

DATABASE MANAGEMENT

Content Defined

- Content = Organization's Property
 - All files, documents, web pages, videos, data collected, employee info, orders, etc.
 - Challenge: Storing and managing all of this information collected

Databases Defined

- DATABASE: A collection of structured data
 - Tables / Files
 - Relationships among rows in tables

1 SMITH, JOHN 123 Rainbow
Road

514-234-3242 3 Normal

2 DOE, JANE 832 Rue Ste.
Catherine

438-233-5463 8 Normal

3 KIMMEL, JIMMY 434 Hollywood
Blvd

312-424-2313 1 VIP

4 DION, CELINE 3721 Falsetto
Lane

418-356-2984 12 Repeat

Storage of Data

- Database Management System (DBMS)
- Efficiently stores and indexes data for later retrieval
- For: Techies, IT team

Presentation of Data

- Content Management System (CMS)
- Controls access to content, organizes it, web-based
- For: End User

Each row is called a

RECORD (one
instance of what is
being collected in
that database)

- E.g. one order,
one customer

Each collection is a table is called a **FILE**. A
database contains many of these

Each column is a **FIELD** – attributes of what we’re collecting data about
Every character in the
database is a **BYTE**

1

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- **PRIMARY KEY:** A column that contains unique data that identifies a row/record in a table

Examples: Student ID, Customer ID, Employee No.

- **FOREIGN KEY:** A column that refers to another table to form a relationship between the 2
 - Matches the primary key of another table
- Using this structure prevents us from storing the same data over and over

Example: Instead of storing all that information about each type of customer, each type is

stored once in a separate table and referred to using the keys

1 SMITH, JOHN 123 Rainbow
Road

514-234-3242 3 1

2 DOE, JANE 832 Rue Ste.

Catherine

438-233-5463 8 1

3 KIMMEL, JIMMY 434 Hollywood

Bld

312-424-2313 1 3

4 DION, CELINE 3721 Falsetto

Lane

418-356-2984 12 2

1 Normal 0% Default customer type

2 Repeat 10% Minimum 10 past orders

3 VIP 15% Celebrities, media, etc.

2

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- **METADATA:** Data about the data

- What type of data are we storing in the column?

Examples: Dates, numbers, characters, currency

Why Databases vs. Spreadsheet?

Databases Spreadsheets

1. Safer (access control)
 2. Multiple users can access it and edit at the same time from anywhere
 3. Can store larger quantities of data
 4. Better data integrity (fewer errors, duplicates)
 5. Easy to generate reports and find data
1. Easier to use
 2. Better for small amounts of data about a single theme (e.g. a list of contacts)

1 SMITH, JOHN 123 Rainbow
Road
514-234-3242 3 1

2 DOE, JANE 832 Rue Ste.
Catherine
438-233-5463 8 1

3 KIMMEL, JIMMY 434 Hollywood
Blvd
312-424-2313 1 3

4 DION, CELINE 3721 Falsetto
Lane
418-356-2984 12 2

3

NUMBER VARCHAR
(variable characters)

VARCHAR NUMBER
(variable characters
because of the dashes ---)

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Database Management Systems (DBMS)

- DBMS: Software that is used to create, process, and manage databases
 - Provides user with access to the database
 - Using the DBMS, the data can be created, modified, deleted, read, and secured
 - Most popular DBMS program: Access, SQL Server, MySQL, DB2
 - The language used to speak to databases is called **STRUCTURED QUERY**

LANGUAGE (SQL)

- Made up of **queries** – questions that we ask the data to answer

Database Applications

- The tools that users use in the DBMS in order to interact with the database
 - Allows the user to interact without typing in SQL (code)
 - Includes: REPORTS, FORMS, and QUERIES
- Often allow **MULTI-USER PROCESSING** – multiple updating the DB simultaneously
 - **LOST-UPDATE PROBLEM:** When two people open up the same file, edit it, and both save it... the person who saved last overwrites the other person

Types of DBMS

- ENTERPRISE DBMS: Used in organizations and large groups
- PERSONAL DBMS: Used for small, simple databases
 - Often used by fewer than 15 people
 - Only remaining one is **MICROSOFT ACCESS**

DBMS

Database

User

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Entity-Relationship Diagrams (ERD)

- DATA MODEL: A visual representation of what the database will look like (a blueprint)
 - Shows the structure of how the data is stored and how everything is related
 - The most popular data model is the ENTITY RELATIONSHIP DIAGRAM (ERD)
 - Second most popular is the UNIFIED MODEL LANGUAGE (UML)
 - For COMM 226, you need to be able to draw ERDs and just be aware that UML exists

Components of an ERD

Entities Something that we are collecting data about • CUSTOMER

- ORDER

Attributes Characteristics about the entity • CUSTOMER_NAME

- ORDER QUANTITY

Relationships Common data between entities • CUSTOMER places ORDERS

- NOTE: All entities should have an identifier, something that distinguishes 1 row from another

- This becomes the primary key when we want to make relationships

Example #1A

A university in Montreal has a database for course scheduling. The university keeps track of all

employee information for their professors including address, phone number, years with the

company, and which department they are in. The professors teach courses that are in turn taken

by students. The university evidently tracks the student ID numbers, their names, addresses,

major, and email address. When registering for a course, students know which the name of the

course, the course code, the time at which the course is taught, the room it's in, and the

professor's name.

List all entities and their attributes. Then, draw relationships between the entities.

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How are to draw the ERD

Types of Relationships

1. ONE-to-ONE relationships (1:1)
2. ONE-to-MANY relationships (1:N)
3. MANY-to-MANY relationships (N:M)

Each relationship must have a verb on it to describe the nature of said relationship (**example:** is bought by).

Example #1B

A course can be taught by many professors. All courses are taught by one and only 1 professor.

Students can take multiple classes in a semester.

Using the entities, attributes, and relationships you listed in the previous example, add the crow's

foot notation and draw the ERD diagram

ENTITY NAME

ATTRIBUTE NAME

ATTRIBUTE NAME

ATTRIBUTE NAME

ATTRIBUTE NAME

ENTITY NAME

ATTRIBUTE NAME

ATTRIBUTE NAME

ATTRIBUTE NAME

ATTRIBUTE NAME

Crow's Foot

Notation

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Cardinality

- 1:N or N:M represent a relationship's MAXIMUM CARDINALITY
 - N and M represent variable numbers

Example: A customer can place many (N) orders

- The MINIMUM CARDINALITY is a constraint in the relationship, the minimum required

Example: A customer must place at least 1 order to be in the system

Example #1C

Some teachers do not teach any classes. However, all courses must be taught by one and only one

professor. Students also may not be taking classes in the event that they are taking a semester off.

Re-draw your ERD diagram this time adding the minimum cardinality.

1 and only 1

Zero or 1

1 or more

0 or more

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SOS Step Box

STEP 1: Read the case once and make a list of all the entities.

STEP 2: Re-read the case and list all attributes for each entity. Don't forget to include an identifier for each.

STEP 3: Make a box around each entity and all of the attributes. Re-read the case and draw the relationships between each of the entities.

STEP 4: Using the lists you've made, DRAW YOUR ERD.

STEP 5: Re-read your case one last time – fill in the cardinality and add verbs throughout your diagram.

STEP 6: Include a foreign key on the MANY side of each relationship.

STEP 7: State assumptions as needed.

Example #2 – Timeless Inc. CDs

In 2013, Matthew and Chelsea Martin opened Timeless Inc., a family-owned business that sells audio CDs of classic and best-selling children's stories.

The Company has a number of distributors that supply them with the CDs for resale. The

company collects information about the location of each distributor and the number of purchases made from each one.

For selling purposes, the CDs are classified by appropriate age groups: 3– 6; 7– 12; and 13– 17.

Roughly 20% of total sales occur within their single retail store; the remaining 70% are through

the website. Sales are particularly strong during the summer vacation months and Christmas

shopping season. As such, dates and amounts are always collected for planning purposes.

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Many-to-Many relationships

- When you have a many-to-many (N:M) relationship, you need to break it apart
 - Add a table in between containing the names of both

Example #3 – M&H Clothing

M&H is a clothing retailer located around the world. Each store has its own database to manage its operations. M&H has several suppliers from which it receives clothing. The company thus tracks what the company supplies, their contact information, and address. All products have a SKU, a quantity in stock and price associated with it. The products sold range from shirts and pants to jewelry and accessories. All suppliers stored in the system have supplied at least 1 article of clothing.

When customers make a purchase, the company asks for their phone number and records the number of items purchased as well as the date of their last purchase. Each purchase is also recorded including the date it was made and the employee who made the sale. When the purchase is made, the items that were sold are deducted from the inventory in the system.

ORDER_CUSTOMER

ATTRIBUTE NAME

ATTRIBUTE NAME

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Normalizing Data

- Breaking apart a poorly structured table into two or more well-structured ones
 - Done to prevent DATA INTEGRITY problems
 - Occurs when data is duplicated throughout the database (hard to update)

Example: What if the course name changes? We'd need to update each student's schedule!

- When you see duplicate data, eliminate it by placing it in a new table
 - Each table should only represent one theme, one concept

1 SMITH, JOHN 123 Rainbow
Road

514-234-3242 3 Normal

2 DOE, JANE 832 Rue Ste.
Catherine

438-233-5463 8 Normal

3 KIMMEL, JIMMY 434 Hollywood
Blvd

312-424-2313 1 VIP

4 DION, CELINE 3721 Falsetto
Lane

418-356-2984 12 Repeat

1 Normal 0% Default customer type

2 Repeat 10% Minimum 10 past orders

3 VIP 15% Celebrities, media, etc.

**Separated into a different table so if we were
to update the discount %, it wouldn't have to
be changed for each customer individually**

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Chapter 6

NETWORKS AND COLLABORATION

Networks 101

- It becomes most useful when connected to a network
- COLLABORATION: When two or more people work towards a common goal
 - In IT, this is enabled by IT
 - Dependent on the following 4 factors (the 4C's)

Communication Skills

and Culture

Are we encouraged to collaborate? Are you purposely put into groups like in school?

Communication Systems Do we have access to tools like Skype, Dropbox, or Facebook

Messenger that allow us to work together remotely?

Content Management Do we have tools to work on the content at the same time without a hassle? (**example:** Google Docs)

Control of Workflow Is there a plan, outlined tasks, divided between members? (**example:** when doing group projects, you split the work and set deadlines from the start)

- Networks are more valuable when more people use them – NETWORKS EFFECTS (chapter 1)

- NETWORK EXTERNALITIES: Synonym for network effects

Example: Google + is less popular than Facebook because few people use it, not because

it's a bad system

Computer Networks

- COMPUTER NETWORK: Collection of computers that send and/ signals from transmission media

- TRANSMISSION MEDIA: Cables, wires, wireless (**example:** cell tower signals)

Network Type Description Examples

LOCAL AREA NETWORK (LAN) Computers connected within a small, single location

Your home network,

Starbucks Wi-Fi

WIDE AREA NETWORK (WAN) Connects computers geographically apart, two or more locations

Concordia Wi-Fi at both

SGW and Loyola campuses

An internet (lower-case i) A collection of several WANs and/or LANs

PepsiCo's internal network

used around the world

The Internet (capital I) The most popular internet What we use every day to access emails and Facebook

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How networks work

- **SWITCH:** An intermediary computer that allows two computers to talk, it translates the message
- **NETWORK INTERFACE CARD (NIC):** Allows a device (computer, phone) to be able to talk to the network (otherwise, the computer is just a box of wires with no connectivity)
 - **ONBOARD NIC:** Built into a computer
 - **MEDIA CONTROL ADDRESS (MAC):** ID for each NIC so the network knows who it is
- **UNSHIELDED TWISTED PAIR (UTP) Cable:** Connects your computer to the network (blue cable you use to connect when there's no Wi-Fi)
- **FIBRE OPTIC CABLES:** Newer cables that can carry more data, and faster
- Today, a cable isn't always need – this is called **WIRELESS LAN**
- **WIRELESS NIC:** Allows devices to connect without wires (e.g. there's one in your phone)
 - **ACCESS POINT (APs):** Like a switch – the computer that all wireless devices connect to
 - Range from 40 to 100 meters
 - **REFLECTORS** or **REPEATERS** may be used to increase this range

How they talk to each other: Protocols (Network Language)

- **PROTOCOLS:** Rules that allow two computers to talk with each other (common language)
 - All devices on 1 LAN must use the same protocol (must speak the same language)
 - **IEEE 802.3 PROTOCOL:** Most popular one today
 - Also known as **ETHERNET**
 - The NICs needed to use this protocol support 10/100/1000 **ETHERNET**

Example:

UTP Cable

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How the Internet works

- The Internet is a WAN
- ROUTER: Helps to implement the protocols for a WAN
- INTERNET SERVICE PROVIDER (ISP): Your router connects to them, they connect to Internet

Examples: Bell, Videotron

Example:

How do devices speak on the Internet?

- TCP/IP (Transmission Control Program / Internet Protocol)
 - Communication language of the Internet
 - There are dozens of sub-languages (protocols) that accomplish different tasks

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The Web vs. the Internet

- NOT THE SAME THING
- THE WEB: Subcategory of the Internet that uses Hypertext Transfer Protocol (http://)
 - i.e. Just the websites on the Internet
- BROWSERS: The software that speaks in HTTP so that you can talk with **websites**

Example: Firefox, Internet Explorer, Safari, Chrome

Naming Websites (Domains)

- All websites have a TLD (Top-Level Domain) at the end of its name

Examples: .com, .ca, .net, .org

- UNIFORM RESOURCE LOCATOR): The address of the website in human language

Example: concordia.ca

- IP ADDRESS: The address of the website in networking language

Example: 198.103.238.30

- IP Addresses can be PUBLIC (websites) or private (your computer)
 - Your address is assigned at random by the DHCP
- DOMAIN NAME SYSTEM (DNS): Converts the URL to IP and vice-versa
 - The translator between human and networking languages
 - This translation process is called DOMAIN NAME RESOLUTION
 - Like a phone book – I'm looking for JMSB ---> JMSB is located at 1450 Guy
 - The translation is done by a DOMAIN NAME RESOLVER
- This translators live in universities, large companies, government

Example:

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Terminology – Connecting the Router to your ISP

- When you send signals from Router to ISP, this signals are ANALOG waves
- Computers speak DIGITAL waves
 - MODULATOR/DEMODULATOR or MODEM: Converts between analog/digital
- DSL Line (Digital Subscriber Line): Uses the telephone line to connect to the Internet
 - Doesn't interfere with phones anymore
- ADSL (Asymmetric Digital Subscriber Lines): DSL Lines with different upload/download speeds
 - UPLOAD: Data that you send
 - DOWNLOAD: Data that you receive
- SDSL (Symmetric Digital Subscriber Lines): DSL Lines with same upload/download speed
- CABLE MODEM: Uses television cable line to connect to the Internet
- NARROWBAND: Lines with transmission speeds of less than 56 kbps

Example: Remember when you had Dial-Up Internet?

- BROADBAND: Lines with transmission speeds of greater than 256 kbps
 - The Internet as we know it

How email works

- SMTP (Simple Mail Transfer Protocol): The protocol used to send emails
 - There are other less common ones as well (MIME, POP, IMAP)
- Connect to the Internet
- Open your email client (which speaks SMTP)
- The email is broken down into **segments** by SMTP
 - Knows how to rebuild it afterwards
- The segments are put into **packets**
 - Finds the IP address of the recipient and sends the packets
- The recipient's computer opens up the packets
 - The email is put back together by SMTP and you can read it!

Network Access

Layer

Internet Layer

(IP)

Transport Layer

(TCP)

Application Layer

(e.g. Gmail)

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How search engines work

- Developed in 1990 by Alan Emtage from McGill
- 1) Collect the URLs from around the Internet
 - 2) Store them so that they can be searched (like a phone book)
- WEB CRAWLER: Software that goes around the Web finding new URLs and updating old ones
 - Like a spider, they crawl around mapping out the Web
 - INDEXING: Sorting out all the URLs found
 - The way things are sorted is a secret
 - Keep in mind they are companies and may place ads in your search result

Mobile Computing

- A device that is mobile and used to connect to the Internet
- Smartphones and laptops are made to communicate on the go
 - M-COMMERCE: Transactions using a mobile device

Example: Banking on your phone, buying tickets on your phone, ordering food

Where will it be used?

(Asian phones are not the same as

Canadian ones)

Connection Speed?

(2G, 3G, 4G, LTE)

Operating System?

(iOS, Android, Windows Mobile)

- Tablets and e-Readers: Hybrid mobile devices originally designed for reading
 - Special "electronic ink" makes reading the screen less straining on eyes

Pros Cons

Your office goes with you wherever you go Constantly Connected

(**example:** you can't leave work behind)

Constantly Connected Compatibility between devices

(**example:** iOS vs. Android apps)

Ownership

(**example:** people want to use their own phone

at work – this concept is called BRING YOUR

OWN DEVICE)

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Firewalls, Encryption, VPNs

- FIREWALL: Controls who has access to the network
- PORT: A number that identifies which service should be used

Example: If we want to load a website (HTTP service), the port is 80

- Firewalls can block ports to prevent access to some services

Example: Block port 80 if you don't want anyone access websites

- PACKET-FILTERING FIREWALLS: Examines messages to determine whether they should

be sent or not (like a coffee filter, only the good stuff gets through)

- Commercial firewalls today are general of this type
- Can be used to block sites (e.g. Facebook or YouTube at work)

- Encryption: Transforming regular text into unreadable text so that it cannot be stolen

- Like using a cryptic code so no one can steal data

Example: Your phone number // 514 848 2424 -----> 2b&bd@bd

- There is a key used to lock and unlock the encryption

- The key is like a switch that changes the phone number from numbers to code
- SYMMETRIC ENCRYPTION: Same key is used to encode and decode **(faster)**
- ASYMMETRIC ENCRYPTION: Different keys are used to encode and decode
- The protocol (language) used for encrypting website is **HTTPS**
- The protocol (language) used for encrypting the data ON the website is **SSL/TSL**
- Used if you're sending sensitive information between your PC and website

Example: Online banking uses this so no one intercepts your info

Access Port 80?

Item sent: virus.com

No.

Access Port 80?

Request: concordia.ca

Yes!

Credit Card

Number

Unlock it when

it gets here

Can't see what it is

since the numbers of

scrambled

:(

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- Virtual Private Networks (VPNs): A private connection between your computer and the website over the Internet (public)
- Virtual because it uses the public Internet, not a real private network
- Makes TUNNELS from your computer to the website, or from one office to another

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Chapter 9

E-COMMERCE, SOCIAL MEDIA, WEB 2.0

E-Commerce

- **E-Business:** Any business activity conducted electronically (using IT)
- This can include any business functions such as looking at reviews before buying instore, checking the weather, customer support

- **E-Commerce:** A sub-category of e-business that involves a transaction (buying or selling)

involving goods or services over a network (public or private)

- Merchant Companies: Buy and sell their goods
- Non-Merchant Companies: Facilitate sales but don't own the goods (intermediary)

MERCHANT COMPANIES NON-MERCHANT COMPANIES

- **Business-to-Consumer (B2C)**

Example: Amazon

- **Business-to-Business (B2B)**

Example: a small clothing store ordering clothes from a supplier in China

- **Business-to-Government (B2G)**

Example: The QC government buying computers from Dell

- **Online Auctions**

Buyers bid like in a real-world auction but all through an online system

Example: eBay

- **Clearinghouses**

The website advertises the goods, and delivers them on behalf of someone else – they never own them

Example: some Amazon items

- **Electronic Exchange**

The website connects buyers and sellers and take a small cut of each sale

Example: Expedia

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Pros and Cons of E-Commerce

1. Disintermediation: The middle man is cut out... the manufacturer sells directly to the customer thus eliminating businesses

2. Available Information: Can now look at reviews and make more informed purchases
3. Price Elasticity: Companies can better understand demand and supply through online tracking and experimenting with prices easily
4. More Feedback: The company and customer can interact easily
5. Convenience: You can shop in your PJs!
1. Channel Conflict: When the artist sells a CD directly to the customer, how does HMV feel?
2. Price Conflict: Buying a book on indigo.ca is cheaper than going into a Chapters store
3. Logistics Expense: its costly for Amazon to ship so many small orders instead of 1 big one
4. Customer Service: The salesperson isn't there to show the customer how the phone works
5. Showrooming: People go into the store to play with the computers, then buy it online (that's why BestBuy stores are shutting down)
6. Taxation: If you buy something from a US retailer, do you pay American or Canadian taxes?

Social Networking

- Social Networking: A web of related individuals and organizations
- Social Capital: The benefit derived from social networking
- From the business' perspective, the following capital exists
 1. Physical capital: Physical resources such as assembly lines, computers, machines
 2. Human Capital: Knowledge and skills from your employees
 3. Social Capital: Social relationships between people (employees, customers, etc.)
 - There are 4 benefits to social capital:

Information

Shows Opportuntiiies, threats, problems, the way the customer is thinking

Influence

Your relationships with co-workers can influence their decision, your customers can influence others to buy (word of mouth)

Social Credentials

Social status helps to shape who you are and the business' brand

Personal Reinforcement

Networks reinforce your professional image or position in an industry

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Weak vs. Strong Relationships

- The people you know best (STRONG) tend to all know each other (close circle of friends)
 - This means your network won't expand with them!
- The people you know least (WEAK) contribute most to your network
 - When you see them at cocktails or other events, you'll meet

Social Networking Enabled by IT

- You don't need a computer to network, but Facebook has made it synonymous with the Internet
- IT brings benefits that don't exist in face-to-face networking
 1. SORTING THROUGH DATA is easier with IT, you can find what and who you need
 2. TRACKING RELATIONSHIPS is easier (such as birthdays, last time we spoke)
 3. NETWORK EFFECTS means that platforms like Facebook will grow as more people use them... this means your network keeps growing automatically!

Web 2.0

- Started with the creation of smartphones, user-created content, social media, e-commerce – not a specific change in technology.

Software A service that is free for all to use via the cloud / the Internet, constantly changing (**example:** Google.ca)

Licenses needed, updates released periodically

Client Thin Client – you don't need to download extra software to use things like Google Maps, Gmail

Thick Client – required downloads, updates
released one at a time

Product Value NETWORK EFFECTS – more users
adds more value (**example:** Twitter)

Value depends on the product
(**example:** a laptop's value depends on its specs)

User Experience Differs on each website (**example:**
Amazon looks different from Expedia)

Static, standardized user interface (**example:** all
MS Office programs look the same)

Content Participation from user is welcome Static – company posts the content

Business Model Free services, advertising for revenue Licenses, software sales

Advertising

Viral, shared by customers Static ads spread everywhere by the company

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Other Terms

- User-Generated Content: The user adds value by creating content (**example:** user reviews)

- Crowdsourcing: New ideas are posted online and customers can pre-order thus contributing

to the product actually coming to life

- Mashups: Taking a service from website and combining with another (**example:** when you

see a Google Map on a company website's "Contact Us" page)

How do companies benefit?

1. ADVERTISING: More targeted and focussed

Example: You can't determine who will see a billboard, for a website you can

2. MASHUPS: More collaboration between businesses

Example: Hotels can team up with car rentals so you can book both simultaneously

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Chapter 10

Acquiring IS through Projects

Project Management

- Standards put in place through the **PMBOK** (Project Management Book of Knowledge)
 - Developed and maintained by **PMI** (Project Management Institute)
 - People certified to manage projects are **PMPs** (Project Management Professionals)
 - **ITPM** (Information Technology Project Management) are techniques and methods used to better run projects used by all project managers
- If it involves technology, it becomes an **IT Project**
 - Affects all 5 components of the system (including people and procedures)

The Iron Triangle

*** The key to successful projects is good **planning** ***

Operations vs. Projects

- IT Operations: The day-to-day tasks
 - GOAL: Keep things running efficiently, stable, predictably, and securely
- Projects: Implementing changes over a set period of time
 - GOAL: Improve the business
- ITIL (Information Technology Infrastructure Library) = PMBOK for operations
 - Standards and procedures for driving value from operations
 - People working in operations usually specialize (e.g. Windows expert, website admin)

Set goals and

objectives Define Scope Use time and
resources to do it Completion

- It's almost impossible to get all 3 in balance
- Only **16%** of projects are completed on time, within budget, and on scope
- **30%** of projects are cancelled before completion

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Risks in Projects

1. SCOPE: IT is virtual, i can't see what the project will look like when complete
2. COSTS: IT costs are constantly changing
3. TIME: How do I know how long each part will take?

Risks aren't only related to the technology, it's also human!

- Lack of knowledge
- Unclear requirements
- Too complex
- Lack of support from management

Acquiring New Systems

Key Questions

- Do you have the skills needed to develop it?
- Which option is cheapest?
- Which takes the least time?
- Which best meets our needs?
- Does something already exist on the market (no need to re-create it)?
- How will integrate with our existing systems?

Hardware Software Data Procedures People

Buy it (no
customization)

Buy it (then
customize) Rent or Lease it

Develop it
yourself

Outsource

Development

INTEGRATE with our
existing programs and
infrastructure

INTEGRATE with our
current databases

INTEGRATE with the
way we do things

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Implementing New Systems

- System Development Life Cycle (SDLC): a classic process for acquiring or developing IS

Phase 1: System Definition

- Define Goals and Purpose

Example: Help PepsiCo compete against a new competitor

Example: Enable Starbucks to take online orders

- Assess Feasibility
 - Cost Feasibility: Do the benefits outweigh the cost?
 - Schedule Feasibility: Can we complete it in reasonable time?
 - Technical Feasibly: Can our existing systems work with the new system?
 - Organizational Feasibility: Will it fit with the way we work? Culture? Legal?

Phase 2: Requirements Analysis

- It's hard to visualize what the system will look like when complete
- Involve the end users of the system, they know best how the system will be used

Example: The accountants know what they need to do their job better than IT does

- Getting users on board helps to gain their support
- Now is the cheapest time to change the requirements

Example: Adding a new feature half way through the project is costly

- Team consists of SYSTEMS ANALYSTS and BUSINESS ANALYSTS in this phase
 - These people need to understand both IT and the business (MIS background)

Phase 3: Component Design

- If you choose to BUY IT, there will always be discrepancies between what you need

what is offered

- Commercial off-the-shelf (COTS) software will never fit super comfortably

COMPANY STRATEGY (CHAPTER 3)

- Industry Forces (Porter's 5)
- Value Chain (internal improvement)
- Competitor Actions

PROJECTS

Improvements that make us
more competitive or help us
to execute the strategy

Organization's

Response

How to deal with discrepancies

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- If you choose to BUILD IT, you need to design all 5 components of the IS

Phase 4: Implementation

- Once it's all designed, the programmers come in and make it (coding, programming)!
- If it's purchased, this is when we start hooking things up and installing all the components
- SYSTEM TESTING
 - Test Plan: List of actions users need to perform to test all parts of the system

Example: Try to log in

Example: Press the button; write down which page it brings you to

- Product Quality Assurance: Same as testing
- Beta Testing: Allows users to try the system on their own before fully released
- TRANSITIONING TO THE NEW SYSTEM (CONVERSION)

Pilot The whole system is implemented into 1 part of the business to see how users will react. Allows us to test and improve before giving to everyone.

Phased Different parts of the system are released to different parts of the organizations one at a time. This allows users to adapt and allows to regional tweaking.

Example: Week 1 – Accounting gets it, Week 2 – Marketing team gets it

Parallel The old and new system runs at the same time for a short period. Very costly

but provides a nice fallback plan in case of problems

Plunge Unplug the old system, plug the new one it – all in one shot

Phase 5: System Maintenance

- Making modifications as needed after implementation
- Patch or service packs fix the problems
- Prioritize requests for changes
 - Requests can either be due to errors or just for suggested improvements

Hardware

Pick computers, servers,
wires needed to run the
new system

Software

Which operating system
do we need? User
interface?

Data

Design the database or
modify it as needed

Procedures

How to use the system,
backups, recovery if
there's failures,
documentation

People

Users need to be
informed and trained

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Weakness of SDLC Methodology

1. Considered a **WATERFALL METHOD**... once you move to the next phase, you don't go back

- Example: Once you start designing, sometimes you need to go back and redo some

requiring with the end user... SDLC doesn't allow for this

2. Some projects are just too complicated

- Example: Can you list all the requirements to build an airplane all at once?

i. **ANALYSIS PARALYSIS**: When documentation and defining requirements goes on forever even when we have enough to move forward

Other Methodologies

- Agile Methods: Like hybrid methods
- Why they exist? No single process works for all organizations

Outsourcing

- **OUTSOURCING**: Having another organization perform a service for you (**example**: manage

your database)

- If they are on a different continent, this is called **OFFSHORING** (**example**: Indian call centers)

Advantages Disadvantages

1. IT isn't everyone's expertise
2. Less costly elsewhere (India, China)
3. Risk reduction (projects often fail)
1. Loss of control

2. Tied to the developer (they know your system better than you)

3. If they mess up, you still pay

4. Expensive and difficult to change vendors

- APPLICATION SERVICE PROVIDERS (ASPs): Provides software and applications for rent

- The system is maintained by the ASP and is accessed via the Internet

- Risks include:

1. No control over your data, stored abroad

2. If you lose the Internet, your whole system can't be used

3. Can get locked-in, make sure you can take your data if you need to switch vendors

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Chapter 11

STRUCTURE, GOVERNANCE, ETHICS

IT Department Structure

- Technology: Lead by the Chief Technology Officer (CTO) – in charge of new tech & innovation

- Operations: Day-to-day administration (network administrators, infrastructure, user support)

- Development: Improve current system and implements new ones

- If the company develops in-house: includes programmers, testers, project managers

- If the company only buys: Mostly business and system analysts

- Outsourcing Relations: Monitors relationships and service levels

- WEB • Marketing Team

- Most jobs in IT require communication skills, business skills, and interpersonal skills

CEO

VP Marketing CFO

Chief

Information

Officer (CIO)

Technology Operations Development Outsourcing

Relations

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IT Architecture

- IT should contribute to the company's strategy

Example: Wal-Mart invests heavily in IT to make logistics flawless • lowers prices

- IT Architecture: The plan for everything IT in the business
 - All computers, when they're bought, when they should be replaced, who's in charge of what, what software is on which computers, networking, access controls, etc.
 - ENTERPRISE ARCHITECT: Job title in large organizations for person who manages this
 - ZACHMAN FRAMEWORK: A model for IT architecture to help companies develop it
- ALIGNMENT: When the IT department's mission, goals, and plans overlap with the organization's ones
 - Major challenge in business today
 - Requires constant communication between business and IT

IT Governance

- GOVERNANCE: Standard management policies and processes for IT services
 - Deals with sourcing, prioritizing IT investments, security, and privacy
 - Recent laws have made this increasingly important for companies

1. Budget Measures Act (ONTARIO)

2. Sarbanes-Oxley Act (SOX)

- **Sarbanes-Oxley Act (SOX)**

- Result of fraud in the early 2000s (Enron, WorldCom)
- Key executives are now criminally liable
- Requires companies to create internal controls to protect:

Financial

Statements

Company Assets

(databases, data
collected)

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- **IT Audit**

- INFORMATION SYSTEMS AUDIT: Making sure that the IT systems that hold financial

data are secured and that the data inside of them are reliable

- INFORMATION SYSTEMS AND CONTROL ASSOCIATION (ISACA): Develops standards for IT governance and IT audit

- CERTIFIED INFORMATION SYSTEMS AUDITOR (CISA): Professional designation for people who do the IT audits

- CONTROL OBJECTIVES FOR INFORMATION AND RELATED TECHNOLOGIES (COBIT): Frameworks and standards that help to align IT with the business

Ethics and Green IT

- Computers don't have ethics, it's how HUMANS use the data that causes the problems

- Issues surround privacy of data and what we do with it

- GREEN IT: Understand the impact of our tech resources on our environment

- TRIPLE-BOTTOM LINE: Not all about the money

- ENERGY STAR: An international program that labels products that consume less power

Example: Consume less electricity to run

Example: Sleep mode on computers after 15 mins of inactivity

- E-CYCLING: Recycling computers and devices

- E-WASTE: Disposing of computers and devices

Business

Strategy IT

Profit

Planet People

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Chapter 12

MANAGING INFORMATION SECURITY AND PRIVACY

Identity Theft and PIPEDA

- **IDENTITY THEFT:** Critical personal information is stolen and used to impersonate a person
 - One of the fastest growing crimes in Canada
 - Commonly Stolen Information: Social insurance Number, name, address, credit card
- Organizations have a responsibility to keep customer data safe --> PIPEDA
 - PIPEDA = Personal information Protection and Electronic Act (a Canadian act)
 - Under this act, business what tell you...
- 1. What they are collecting
 - **Example:** Websites that record when you visit tell you this in their terms of service
- 2. What they will do with your information
 - **Example:** Apple can't sell your information to Facebook without telling you
- 3. How they keep your information safe (upon request)
 - **Example:** You have the right to know what country Google stores your info in

Threats faced by Organizations

SECURITY THREATS PROBLEMS

1. Human Error (Accident)
2. Malicious Behaviour (Intentional)
3. Natural Events (Non-Human)
1. Unauthorized Data Leak
2. Incorrect Data Modification
3. Faulty Service
4. Denial of Service
5. Infrastructure

HOW DATA GETS OUT INTENTIONALLY

General (examples: Phone, in-person)

- Pretexting: Saying that you are someone you're not to gain access to sensitive information

Example: Someone calls pretending to be your bank and asks for your account number

- Spoofing: Hiding your identity to pretend someone you're not

Example: When the caller also disguises their number as the bank's

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IT Specific

- Phishing: Same as pretexting but done via email

Example: Email from your "bank" telling you to click a link to change your password

- Email Spoofing: Synonym for phishing
- IP Spoofing: When the website pretends to be another then directs you to another one
- Sniffing: Intercepting communication to steal the data

Example: a virus that makes a copy of all emails you send

- Hacking: Gaining unauthorized to a system for malicious reasons (stealing, wreaking havoc)

As a result of all these threats, management must create security procedures to manage risks...

Hardware

Software

Data

Procedures

People

Technical Safeguards

Data Safeguards

Human Safeguards

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Technical Safeguards

1 Identification and Authentication

Ways of determining

who is accessing the

computer and validating

that it's the right person

- Username and Password
- Smart Cards (employee badge)
- Biometric Authentication: Eye or hand scanner

- Single Sign-On: You only enter your password once but have access to all your applications such as email, intranet, etc.

2 Encryption and Firewalls

Sending data safely
between computers
and networks

See Chapter 6

3 Malware Protection Software programs and human actions that are used to prevent and remove viruses, worms, malware, spyware, etc.

- Antivirus and antispyware software
- Scan frequently
- Update malware definitions (how the antivirus programs detect new viruses)
- Be careful with email attachments
- Install updates and patches
- Be careful of where you use Internet

Data Safeguards

1. Database Administration: Policies and standards used to manage databases
2. Backups: Creating copies of the database in case it fails
3. Physical Security: Log who goes into the rooms where databases are stored

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Human Safeguards

1 For Employees Segregation of Duties

Just like in accounting, the person approving accesses should not be same person granting them
Assign least possible

privileges

Only give employees access to the data they will need regularly

Document accesses

This allows companies to modify and remove access easily as needed

Security Training All new employees should be subject to training and shown the security policies

Enforcement 3 components (RAC) *

Termination Accesses should be removed as quickly as possible when someone quits or is fired. If they leave on bad terms, be aware of the risks (e.g. stealing customers)

Hire and screen carefully Be careful of who you hire especially if the job requires them to have access to sensitive information

2 For Non-Employees

Hardening Given temporary employees and contractors very basic access

Protect Supplies,

Customers

Make sure the systems they use (e.g. your website) are safe

3 Account Administration

Account Management ○ Giving Access

○ Modifying Access

○ Removing Access

Having unused accounts left around in your system is extremely unsafe!

Password Management** Require employees to choose safe passwords

Help-Desk Policies For instance, when you call your bank, they

ask security questions so they know that it's really you

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Procedures and Operations 1. NORMAL: How to perform jobs properly

2. BACKUP Operations: How to make sure we have copies of everything and are prepared if something stops working

3. RECOVERY Operations: How to restore the system if it goes down

4 Security Monitoring

Check logs and investigate incidents

Systems log who accesses them, who performs operations, etc. When something goes wrong, you need to use this data and patch your software or procedures as needed!

*** RAC determines who enforces different parts of the systems (e.g. credit card data)**

R – Who's **RESPONSIBLE** for the credit card data

A – Who's **ACCOUNTABLE** if someone hacks it

C – Who's in charge of ensuring that everyone **COMPLIES** to the security policy

**** PASSWORD ETIQUETTE**

1. Change password immediately when it's created

2. Change passwords frequently

3. Don't let users switch back and forth between passwords

4. Require a mix of lower-case, UPPER-CASE, numbers, and special characters (\$%&)

NEVER give your password out to anyone... if someone really needs it, go enter it for them

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Disaster Recovery and Business Continuity Plans

If disaster strikes, whether human or natural, we need to make sure the business keeps working!

1. LOCATION: Make sure you know where data is backed up and spread around

Example: If there's an earthquake in California, Apple must keep operating elsewhere

2. MISSION-CRITICAL SYSTEMS: Know the basics you need to keep running

Example: Google has multiple servers that are used for Gmail – if one goes down, the others

kick in to keep the service going

3. HOT SITES: Third-party companies that keep backups at a fee

Example: A law firm will store copies of case material documents elsewhere

4. COLD SITES: Office space to be used in the event of a disaster in your main locations

Example: If your office catches fire, we can restart tomorrow in another office

***** Just like in a fire drill, companies need to practice, have standards for speed, time,**

resource allocation, and plans in place to make sure that nothing can take down the

companies IT or its daily operations ***

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Norrie, Huber, Piercy, McKeown

Introduction to Business Information Systems

Second Canadian Edition

TEST BANK

Tech Guide A

1. After the war, troops came home and began families in earnest, resulting in a generation that we know as the:

*a) baby boomers

b) Gen Xers

c) Gen Yers

d) millennial generation

e) the net generation

2. The children who were born in the 1980s and 1990s are sometimes referred to as the:

a) baby boomers

b) Gen Xers

c) Gen Yers

d) millennial generation

- *e) more than one of the above answers is correct
3. The ICT industry plus ICT professionals in other industries comprise nearly _____ workers.
- *a) 1.1 million
 - b) 2.1 million
 - c) 3.1 million
 - d) 4.1 million
4. Canada's ICT industries alone contribute _____ to the country's GDP.
- a) \$110 billion
 - b) \$120 billion
 - c) \$130 billion
 - *d) \$140 billion
5. From 2002 to 2007, the ICT sector grew by an average of _____ annually, compared with _____ for the overall Canadian economy.
- a) 5.1 percent ; 2.9 percent
 - b) 6.1 percent ; 2.7 percent
 - *c) 5.1 percent ; 2.7 percent
 - d) 6.1 percent ; 2.9 percent
6. The impact of fewer ICT graduates, a retiring ICT workforce, and the ability to communicate anywhere at a very low cost has created a "_____ world," where programmers in Hyderabad now compete with the software developers in Halifax.
- a) full
 - *b) flat
 - c) virtual
 - d) digital
7. The _____ represents over 20 of the largest ICT employers in Canada.
- a) ITM
 - b) ICT
 - *c) CCICT
 - d) ISO
 - e) TRSM
8. The CCICT launched an education initiative in 2009 to encourage high school students to consider ICT careers, with an ICT degree that several Canadian universities will call the _____ program.
- a) Information Technology Management (ITM)
 - *b) Business Technology Management (BTM)
 - c) Commercial Technology Management (CTM)
 - d) Communication Technology Management (CTM)
 - e) Network Technology Management (NTM)
9. Who co-founded Intel?
- a) Bill Gates
 - b) Steve Jobs
 - c) Al Gore
 - *d) Gordon Moore
10. A resumé is _____ static)
- *a) never
 - b) always
 - c) sometimes
 - d) occasionally

11. Your resumé should have four sections. Which of the following is NOT one?
- a) your contact details
 - *b) your photo
 - c) your education
 - d) your experience
 - e) your accomplishments
12. The _____ skill requirements consist of the ability to apply technology in a business environment and the ability to manage business processes, projects, and change)
- a) foundation
 - *b) core
 - c) integrative
 - d) technical
13. Through a company directory or professional organization you can find out the names or positions of senior ICT staff to conduct a(n) _____ interview.
- a) technical
 - b) virtual
 - c) communication
 - *d) information
 - e) personal
14. What factors are important when going for an interview?
- a) eye contact
 - b) handshake
 - c) how you are dressed
 - d) none of the above
 - *e) all of the above
15. One report states that _____ percent of hiring managers take less than 15 minutes to decide whether to hire the candidate)
- a) 38
 - b) 48
 - *c) 58
 - d) 68
16. Half of the decision to hire is based on:
- a) “biology”
 - *b) “chemistry”
 - c) “physiology”
 - d) “psychology”
17. Should you contact the interviewer after the interview is over?
- a) No, don’t bug them too much.
 - *b) Yes, enough to thank them and follow up.
 - c) Yes, every day after the interview.
 - d) It depends on the situation.
18. When you start a new job, you should be known for all but one of the following:
- *a) letting others get accustomed to the new work environment on their own
 - b) integrity, reliability, and quality
 - c) volunteer for new work, showing that you are willing to contribute
 - d) respectfully suggest innovative and fresh ideas
 - e) communicate clearly and professionally with your colleagues
19. In your new job, you want to be remembered as a(n):

- a) recent graduate
 - b) manager
 - *c) professional
 - d) entry-level employee
20. Students with more experience (e)g., co-op students) graduating from Ryerson University's Information Technology Management program attained starting salaries of over:
- a) \$40,000
 - b) \$50,000
 - *c) \$60,000
 - d) \$70,000
21. In discussing earnings, when bonuses were factored in, women _____ men, according to a survey conducted by CIOCAN.
- a) earned less than
 - *b) earned more than
 - c) earned about the same as
 - d) none of the above
22. A significant current shift is the move to a(n) _____ integration of ICT and business.
- *a) stronger
 - b) weaker
 - c) equal
 - d) balanced
23. In preparing for an ICT career, your _____ is the best starting point
- a) network
 - b) personality
 - *c) education
 - d) experience

Norrie, Huber, Piercy, McKeown

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Tech Guide B

1. _____ is the physical component of information technology (IT).
- a) Software
 - *b) Hardware
 - c) Freeware
 - d) Shareware
2. _____ provides the instructions that the computer needs.
- *a) Software
 - b) Hardware
 - c) Freeware
 - d) Shareware
3. When evaluating hardware devices, there are a number of considerations. Which of the following isn't one of them?
- a) cost
 - b) compatibility
 - c) accuracy
 - *d) process
 - e) portability
4. You want the device to be within your budget and to provide the most value for each dollar you

spend) This describes which consideration when evaluating hardware?

- *a) cost
- b) compatibility
- c) accuracy
- d) portability
- e) none of the above

5. Hardware devices work together to form a system. Each device needs to work correctly with the other devices. This describes which consideration when evaluating hardware?

- a) cost
- *b) compatibility
- c) accuracy
- d) portability
- e) none of the above

6. You need your IT devices to work with data and/or information in a specific way. This describes which consideration when evaluating hardware?

- a) cost
- b) compatibility
- c) accuracy
- d) portability
- *e) none of the above

7. You rely on your devices to handle data and instructions without errors. This describes which consideration when evaluating hardware?

- a) cost
- b) compatibility
- *c) accuracy
- d) portability
- e) none of the above

8. You would like to work with your data and instructions as quickly and efficiently as possible. This describes which consideration when evaluating hardware?

- a) cost
- b) compatibility
- c) accuracy
- d) portability
- *e) none of the above

9. Because you may want to work with information as you travel, you need to easily move the devices as well. This describes which consideration when evaluating hardware?

- a) cost
- b) compatibility
- c) accuracy
- *d) portability
- e) none of the above

10. The size, shape, and physical arrangement of IT hardware can affect how and where you use a device) This describes which consideration when evaluating hardware.

- a) cost
- b) compatibility
- c) accuracy
- d) portability
- *e) none of the above

11. A(n) _____ is a very small device made out of semiconductor material that acts as a switch to

control electronic signals.

- a) communicator
- b) XD Chip
- *c) transistor
- d) ALU
- e) CPU

12. _____ chips carry out many different processing operations within a computer.

- a) XD
- b) SD
- c) Memory
- d) Macroprocessor
- *e) Microprocessor

13. _____ chips also use transistors to store data within the computer.

- a) XD
- b) SD
- *c) Memory
- d) Macroprocessor
- e) Microprocessor

14. We use _____ mathematics to describe the state of transistors.

- *a) binary
- b) hexadecimal
- c) fractal
- d) algebraic
- e) finite

15. Data that transistors store as a sequence of discrete symbols from a finite set, are referred to as _____ data.

- a) analog
- *b) digital
- c) sorted
- d) unsorted
- e) finite

16. In binary, the basic unit, a _____, corresponds to a power of two, or as they say in mathematics, binary is base 2.

- a) bite
- b) byt
- c) byte
- *d) bit

17. Binary codes represent letters and numbers through _____ which permits a specific combination of bits to represent each character.

- a) bit encoding
- b) byte encoding
- c) binary encoding
- *d) character encoding
- e) digital encoding

18. For personal computers, the first encoding system was the Standard:

- *a) ASCII
- b) ICT
- c) EBCDIC
- d) Unicode

19. To deal with the increased globalization of business and use of PCs, most IT devices now rely on a more recent standard called:
- a) ASCII
 - b) ICT
 - c) EBCDIC
 - *d) Unicode
20. Hardware devices, such as a computer or PDA, execute instructions as a sequence of binary strings known as _____ instructions.
- a) hardware
 - b) software
 - *c) machine
 - d) digital
21. At the core of all computing operations is the:
- a) XD Chip
 - b) transistor
 - c) macroprocessor
 - *d) microprocessor
22. The microprocessor contains the majority of the components that make up the:
- *a) CPU
 - b) ALU
 - c) CDI
 - d) ICT
23. The CPU is located on the system's _____, the main circuit board in an electronic device.
- a) controller
 - *b) motherboard
 - c) peripheral
 - d) transistor
24. The CPU consists of several components. Which of the following isn't one of them?
- a) control unit
 - b) arithmetic logic unit
 - c) floating point unit
 - *d) code unit
 - e) prefetch unit
25. Which component of the CPU performs the following four basic functions: fetch, decode, execute, and store?
- *a) control unit
 - b) cache memory
 - c) floating point unit
 - d) decode unit
 - e) none of the above
26. Which component of the CPU executes mathematical and logic calculations on non-integer values (values that may have a fractional portion after the decimal point)?
- a) control unit
 - b) cache memory
 - *c) floating point unit
 - d) decode unit
 - e) none of the above
27. Which component of the CPU fetches machine language instructions and translates them into binary code that the ALU processes?

- a) control unit
 - b) cache memory
 - c) floating point unit
 - *d) decode unit
 - e) none of the above
28. Which component of the CPU provides a staging area for instructions and the data?
- a) control unit
 - *b) cache memory
 - c) floating point unit
 - d) decode unit
 - e) none of the above
29. Which component of the CPU provides a small amount of memory that stores incoming instructions in a queue while awaiting execution, thereby reducing CPU waiting time?
- a) control unit
 - b) cache memory
 - c) floating point unit
 - d) decode unit
 - *e) none of the above
30. Which component of the CPU has small sections of memory that store data while the microprocessor needs it?
- *a) register
 - b) clock
 - c) bus
 - d) instruction set
 - e) none of the above
31. Which component of the CPU is a crystal that sits on the motherboard and vibrates regularly?
- a) register
 - *b) clock
 - c) bus
 - d) instruction set
 - e) none of the above
32. Which component of the CPU is a set of wires that transports data from one location to another?
- a) register
 - b) clock
 - *c) bus
 - d) instruction set
 - e) none of the above
33. Which component of the CPU is a collection of machine language instructions that governs how the processor interprets and executes various tasks that it performs?
- a) register
 - b) clock
 - c) bus
 - *d) instruction set
 - e) none of the above
34. The size of a CPU's buses determines its_____, which is the number of bits the CPU can process in a single instruction.
- a) speed
 - b) accuracy

- *c) bandwidth
 - d) volume
35. In a computer, the main bus is the data or _____ bus, which sends and receives data to and from the CPU to other components.
- a) internal
 - b) external
 - *c) system
 - d) address
36. The _____ buses control the bandwidth and carry data between the components that reside within the chip, which then connect them to main memory.
- *a) internal
 - b) external
 - c) system
 - d) address
37. _____ speed is probably the most common measure of CPU performance.
- a) Bandwidth
 - *b) Clock
 - c) Internet
 - d) Register
 - e) Bus
38. In IT devices, the main purpose of the _____ is simply to hold instructions that control the device's start-up processes.
- *a) ROM
 - b) RAM
 - c) bus
 - d) operating system
39. A small set of instructions, known as the _____ activates the hardware components and loads the operating system.
- a) RAM
 - *b) BIOS
 - c) bus
 - d) application
 - e) driver
40. RAM can also be found in other components of your computer system, such as the printer and video and sound cards. This type of RAM is often referred to as _____ RAM.
- a) dynamic
 - b) static
 - c) internal
 - *d) peripheral
 - e) video
41. Two factors affect RAM performance. What is one of them?
- a) speed
 - b) accuracy
 - *c) capacity
 - d) cost
42. The primary input methods for a computer include the following EXCEPT:
- *a) printer
 - b) keyboard
 - c) mouse

- d) scanner
 - e) joystick
43. _____ uses a special scanning device to read carefully placed pencil marks on specially designed forms, such as those used in standardized tests.
- a) OCR
 - *b) OMR
 - c) MICR
 - d) MIDI
44. A(n) _____ system uses a special ink that can be read by a special scanner. It is primarily used in the banking industry to print information on cheques for efficient processing.
- a) OCR
 - b) OMR
 - *c) MICR
 - d) MIDI
45. Usually implemented as software, _____ converts scanned print documents directly to electronic text.
- *a) OCR
 - b) OMR
 - c) MICR
 - d) MIDI
46. _____ devices include music keyboards, controllers, and other electronic music devices.
- a) OCR
 - b) OMR
 - c) MICR
 - *d) MIDI
47. _____ refers to how precisely the device can pinpoint a location on a screen or the clarity and level of detail of an image rendered.
- a) Bandwidth
 - *b) Resolution
 - c) Accuracy
 - d) Tracking
48. _____ refers to how close the screen cursor follows the movement of the device.
- a) Bandwidth
 - b) Resolution
 - c) Accuracy
 - *d) Tracking
49. _____ continue to be, by far, the most common category of output device.
- a) Printers
 - b) Keyboards
 - c) Memory
 - *d) Display devices
50. _____ are replacing _____ as the display of choice.
- a) CRTs; LCDs
 - *b) LCDs; CRTs
 - c) Both are correct
 - d) Neither are correct
51. For LCDs, the rate at which the voltage to each pixel is refreshed is called the refresh rate, measured in:
- *a) hertz (Hz)

- b) megahertz (MHz)
 - c) gigahertz (GHz)
 - d) none of the above
52. Which of the following is not one of the four types of touch screen technology in use?
- *a) passive touch screen panel
 - b) surface wave technology
 - c) capacitive touch screen
 - d) electromagnetic digitizer
53. A(n) _____ uses a specially coated resistive layer. Touching this layer sends an electrical charge to the controller for processing.
- *a) resistive touch screen panel
 - b) surface wave technology
 - c) capacitive touch screen
 - d) electromagnetic digitizer
54. A(n) _____ uses ultrasonic waves that pass over the touch screen panel. Changes in the ultrasonic waves that result from touching the panel are registered and sent for processing.
- a) resistive touch screen panel
 - *b) surface wave technology
 - c) capacitive touch screen
 - d) electromagnetic digitizer
55. A(n) _____ is coated with a material that stores electrical charges. Touching this panel draws a small amount of charge to the point of contact.
- a) resistive touch screen panel
 - b) surface wave
 - *c) capacitive touch screen
 - d) electromagnetic digitizer
56. Newer tablet PCs use a(n) _____ that accepts input only from a special pen containing an electromagnetic coil.
- a) resistive touch screen panel
 - b) surface wave
 - c) capacitive touch screen
 - *d) electromagnetic digitizer
57. A(n) _____ prints very high quality graphics, although at slow speed, by manipulating a pen over a page.
- a) printer
 - b) multifunction machine
 - *c) plotter
 - d) scanner
58. The sharpness of text and images on paper is usually measured in:
- a) PPM
 - b) BPS
 - c) Hz
 - *d) DPI
59. Printer speed is measured as the page rate in:
- *a) PPM
 - b) BPS
 - c) Hz
 - d) DPI
60. Which of the following is an example of an optical storage technology?

- *a) DVD
 - b) HDD
 - c) tape
 - d) USB flash drives
61. Which of the following is an example of a magnetic storage technology?
- a) DVD
 - *b) HDD
 - c) CD
 - d) USB flash drives
62. Which of the following is an example of a chip-based storage technology?
- a) DVD
 - b) HDD
 - c) Tape
 - *d) USB flash drives
63. The _____ handles requests from either application programs or hardware and then determines the processing order of the requests.
- *a) kernel
 - b) colonel
 - c) colony
 - d) none of the above
64. The _____ is a specific process that allows the application program to make requests to the operating system or another application.
- *a) API
 - b) DPI
 - c) BPS
 - d) PPM
65. This start-up procedure relies on the use of the ROM chip, which permanently stores the instructions. What is this procedure called?
- a) BPS
 - b) BIOS
 - *c) Boot
 - d) Book
66. POST stands for:
- a) power-on system-test
 - *b) power-on self-test
 - c) power-on start-test
 - d) power-on star-test
67. With _____, the CPU only handles a part of one task at a time.
- a) tasking
 - *b) multitasking
 - c) parallel processing
 - d) perpendicular processing
68. With _____, the multiple CPUs in the same computer handle either multiple different jobs or multiple parts of the same job at the same time.
- a) tasking
 - b) multitasking
 - *c) parallel processing
 - d) perpendicular processing
69. The operating system must know the location of the word processor program files, as well as

the location of a variety of utility files, known as _____ files.

- *a) .DLL
- b) .EXE
- c) .JPG
- d) .WIN

70. The OS handles this via a table of the various file parts and their locations on the disk, called the:

- a) NTFS
- b) DLL
- c) EXE
- *d) FAT

71. Virtually all operating systems now use a _____ (tree) structure that divides a long list of files into several shorter lists.

- a) vertical
- b) horizontal
- c) diagonal
- d) colonial
- *e) hierarchical

72. If a sales manager needed to automatically list the items according to item type in a spreadsheet, they would use the _____ tool.

- a) filter
- b) programming
- c) application
- *d) sort

73. _____ software refers to programs for which the authors allow anyone to view the source code the programming instructions—and make changes.

- *a) Open source
- b) Freeware
- c) Shareware
- d) Share-source
- e) Proprietary

74. _____ software requires a purchased licence and typically restricts access to the source code to the company employees.

- a) Open source
- b) Freeware
- c) Shareware
- d) Share-source
- *e) Proprietary

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Tech Guide C

1. Which type of server handles high-speed processing?

- *a) application
- b) database
- c) web
- d) file
- e) mail

2. Which type of server provides both software and data files to users?
 - a) application
 - b) database
 - c) web
 - *d) file
 - e) mail
3. When each computer in the network is on the same level as other computers and each computer is equally responsible for overseeing the functions of the network it is a(n) _____ network.
 - a) client/server
 - *b) peer-to-peer
 - c) flat
 - d) computer
4. Which of the following is NOT a disadvantage of a client/server network?
 - a) There is a more complex programming relationship between clients and servers.
 - b) There are more complex computer and network security issues due to increased numbers of users.
 - c) System upgrades require upgrading of all clients and servers, regardless of location.
 - *d) The system can be upgraded in small steps.
5. Which of the following is NOT an advantage of a client/server network?
 - a) The computing burden is shared among servers and clients.
 - b) Specialized servers handle one particular type of task.
 - *c) System upgrades require upgrading of all clients and servers, regardless of location.
 - d) The system can be upgraded in small steps.
 - e) The loss of one client does not stop other clients from accessing the server.
6. The _____ created the original version of the network layer model.
 - a) OSI
 - b) OISE
 - *c) ISO
 - d) ICANN
7. The network connection divides the message into smaller digital units called _____ each of which contains a specific number of bytes.
 - a) parcels
 - b) packs
 - *c) packets
 - d) pings
8. At the network connection layer, each packet receives a sequence number and a(n) _____ address.
 - *a) destination
 - b) source
 - c) intermediary
 - d) temporary
 - e) permanent
9. _____ switching routes individual packets through the network based on their destination addresses.
 - a) Route
 - b) Application
 - *c) Packet
 - d) Network
10. _____ switching is the key enabling technology that makes it possible to build large-scale,

survivable networks like the Internet.

- a) Route
- b) Application
- *c) Packet
- d) Network

11. A(n) _____ is a type of computer with the sole purpose of accepting packets and determining the best way to send them to the destination computer.

- a) hub
- b) bridge
- c) switch
- *d) router

12. _____ cable, which transmits cable television signals into your home, is also widely used in networks.

- *a) Coaxial
- b) Fibre-optic
- c) Ethernet
- d) Twisted-pair

13. _____ cable is the newest medium and consists of glass strands that can transmit a large number of signals at extremely high speeds.

- a) Coaxial
- *b) Fibre-optic
- c) Ethernet
- d) Twisted-pair

14. _____ are high-frequency radio transmissions that can be sent between two Earth stations or between Earth stations and communications satellites.

- a) Radios
- b) Infrared
- c) Satellites
- *d) Microwaves

15. Because most telephone and cable systems are analog, _____ convert digital signals from the computer into analog signals for transmission over the communications link.

- a) modulators
- b) demodulators
- *c) modems
- d) routers

16. Data rate is measured in:

- *a) BPS
- b) DPI
- c) PPM
- d) MHz

17. _____ relates to how fast a single message can be transmitted between two nodes.

- a) Traffic
- *b) Latency
- c) Capacity
- d) Tenacity
- e) Bandwidth

18. The term _____ often used in relationship to data rate, measures how fast data flow on a transmission path.

- a) traffic

- b) latency
 - c) capacity
 - d) tenacity
 - *e) bandwidth
19. A(n) _____ is a combination of hardware and software that connects two dissimilar computer networks.
- *a) gateway
 - b) router
 - c) hub
 - d) firewall
20. Bluetooth is a form of _____ area network.
- a) local
 - b) municipal
 - c) wide
 - d) campus
 - *e) personal
21. A _____ provides the physical connection between a computer and a local network.
- a) motherboard
 - b) hub
 - *c) network interface card
 - d) cable
22. An email address consists of two parts: the user name and the _____ address.
- a) domain
 - b) Internet
 - c) source
 - d) destination
 - *e) server
23. The rightmost part of an email address is known as the top-level:
- *a) domain
 - b) Internet
 - c) source
 - d) destination
 - e) server
24. _____ is a not-for-profit company set up over 10 years ago specifically to administer the domain name system.
- a) ISO
 - *b) ICANN
 - c) OSI
 - d) W3C
 - e) None of the above
25. _____ means that the sender and receiver are not communicating at the same time.
- a) Synchronous
 - *b) Asynchronous
 - c) Analog
 - d) Digital
26. _____ means that the sender and receiver are communicating at the same time.
- *a) Synchronous
 - b) Asynchronous
 - c) Analog

- d) Digital
27. Postal mail is often referred to as _____ mail.
- a) small
 - b) slow
 - *c) snail
 - d) snow
28. Distributing files to a large audience is done by placing them on a(n) _____ server and having the users download them over the Internet.
- a) NNTP
 - b) ITP
 - c) HTTP
 - *d) FTP
29. _____, a computer scientist, developed the Web in 1989, at the European Laboratory for Particle Physics (CERN) in Geneva, Switzerland
- a) Bill Gates
 - *b) Tim Berners-Lee
 - c) Steve Jobs
 - d) Al Gore
30. In web terminology, the address of a web page is referred to as its:
- *a) URL
 - b) TCP/IP
 - c) FTP
 - d) HTTP
 - e) HTTPS
31. A(n) _____ is not an application or virus, but simply a data file that will be accessed by the related website the next time you visit it.
- a) biscuit
 - b) crumb
 - *c) cookie
 - d) link
32. How many characters long can an SMS message be?
- a) 140
 - *b) 160
 - c) 255
 - d) 256
33. In 2009, approximately how many messages were sent on mobile?
- a) 2 million
 - *b) 5 million
 - c) 10 million
 - d) 20 million
34. Sending a message on your mobile phone that contains a picture is referred to as a(n):
- a) SMS
 - b) IM
 - c) MMI
 - *d) MMS

Tech Guide D

1. A(n) ____ database is structured with tables that are related to one another so data can be stored and retrieved efficiently.

- *a) relational
- b) rational
- c) informational
- d) accessible

2. To query a database, it is common practice to use which language?

- a) Java
- b) C+
- c) XML
- *d) SQL

3. SQL stands for:

- a) sequenced query language
- *b) structured query language
- c) simplified query language
- d) simple query language

4. A _____ key is a field that holds a unique value for each record.

- a) combination
- b) foreign
- *c) primary
- d) private
- e) public

5. A table is known more formally as a(n):

- *a) entity
- b) record
- c) relationship
- d) field

6. The _____ keyword designates which fields to display as a result of the query.

- a) FROM
- *b) SELECT
- c) WHERE
- d) AND
- e) OR

7. The _____ keyword designates which tables to search when querying a database.

- *a) FROM
- b) SELECT
- c) WHERE
- d) AND
- e) OR

8. The _____ keyword specifies the search criteria, or query condition to use in finding records.

- a) FROM
- b) SELECT
- *c) WHERE
- d) AND
- e) OR

9. Is SQL case-sensitive?

- a) Yes
 - *b) No
 - c) For keywords only
 - d) Sometimes
10. To designate a character or text constant as such, you must use which punctuation marks?
- a) Exclamation point
 - b) Question mark
 - *c) Quotation marks
 - d) Ampersand
11. Which of the following SQL statements is correct?
- a) FROM Table SELECT Field WHERE Record = 'X' ORDER BY Field
 - b) WHERE Record = 'X' SELECT Field FROM Table ORDER BY Field
 - c) SELECT FROM Table Field WHERE Record = 'X' ORDER BY Field
 - d) ORDER BY Field SELECT Field FROM Table WHERE Record = 'X'
 - *e) None of the above is correct
12. Which comparison operators below is not used in conjunction with the WHERE keyword?
- a) greater than (>)
 - b) less than (<)
 - c) greater than or equal to (>=)
 - *d) added to (+)
 - e) not equal to (<>)
13. It is also possible to combine conditions in a query by using the AND or OR operators, known as _____ operators.
- a) comparison
 - *b) compound
 - c) arithmetic
 - d) logical
 - e) aggregate
14. The _____ operator uses the wildcard character as a replacement for unknown or nonexistent characters in an attempt to find matches to a group of characters.
- a) AND
 - b) OR
 - c) SELECT
 - *d) LIKE
 - e) WHEN
15. To insert a new record for a book with an item code of KOB, a retail price of \$12.95, and an item cost of \$7.95 into the Product table of a database, the SQL statement is:
- *a) INSERT INTO Product Values('KOB', 'Book', 12.95, 7.95)
 - b) INSERT INTO Product Values('KOB', 'Book', '\$12.95', '\$7.95')
 - c) ADD INTO Product Values('KOB', 'Book', 12.95, 7.95)
 - d) ADD INTO Product Values('KOB', 'Book', '\$12.95', '\$7.95')
 - e) None of the above
16. Which of the following SQL statements will change all the records from the table Courses that begin with ITM and change it to BTM?
- a) CHANGE Course WHERE CourseCode = 'ITM' SET CourseCode = 'BTM'
 - b) CHANGE Course SET CourseCode = 'BTM' WHERE CourseCode = 'ITM'
 - c) UPDATE Course WHERE CourseCode = 'ITM' SET CourseCode = 'BTM'
 - *d) UPDATE Course SET CourseCode = 'BTM' WHERE CourseCode = 'ITM'

e) None of the above

17. Which of the following SQL statements will delete all the records from the table Students that have the last name "Sample"?

a) REMOVE FROM Courses WHERE LastName = 'Sample'

b) REMOVE WHERE LastName = 'Sample' FROM Courses

*c) DELETE FROM Courses WHERE LastName = 'Sample'

d) DELETE WHERE LastName = 'Sample' FROM Courses

e) None of the above

18. In order to use an aggregate function, you must use a _____ field.

a) numeric

b) alpha-numeric

c) string

*d) dummy

e) none of the above

19. The SQL operation used to calculate certain values in the table, such as COUNT are called _____ functions

a) comparison

b) compound

c) arithmetic

d) logical

*e) aggregate

20. Which of the following is not an aggregate function?

a) AVG

*b) CNT

c) MIN

d) MAX

e) SUM

21. Which of the following is not an advantage to using a relational database?

*a) Increasing data redundancy

b) Improving data access and sharing by using database standards

c) Maintaining the integrity of the data by having security and controls to prevent errors, duplication, and unauthorized entry

d) Allowing configurable views of the data to match the user needs

22. The first step in logical modelling is to create a(n):

a) DRM

b) RDM

*c) ERD

d) DRD

23. Businesses then build a(n) _____ that adds the attributes and helps to organize them to creating the database.

a) DRM

*b) RDM

c) ERD

d) DRD

24. It is not possible to create a primary key–foreign key relationship with a many-to-many relationship. As a result, you need to draw a new relational:

a) diagram

b) table

- c) record
 - *d) entity
 - e) database
25. The relational entity is connected to each original entity by a _____ relationship.
- a) many-to-one
 - *b) one-to-many
 - c) many-to-many
 - d) one-to-one
 - e) none of the above
26. A simple rule of thumb for determining foreign keys is that the primary key from the “_____” side of the relationship is used as a foreign key on the “_____” side of the relationship.
- a) many; one
 - *b) one; many
 - c) many; many
 - d) one; one
 - e) none of the above
27. The relational entity uses the _____ key of each of the tables and its own _____ key.
- *a) primary; primary
 - b) primary; foreign
 - c) foreign; primary
 - d) foreign; foreign
 - e) none of the above
28. _____enforces consistency between linked tables.
- a) Referential locking
 - b) Table locking
 - c) Table integrity
 - *d) Referential integrity
29. The _____ operation creates a single table from two (or more) tables.
- a) CONNECT
 - b) COMBINE
 - *c) JOIN
 - d) ADJOIN
 - e) MIX
30. Another name for a saved query is a:
- a) result
 - b) report
 - c) total
 - *d) view
31. An XML schema file has the extension:
- a) XSL
 - *b) XSD
 - c) XMD
 - d) XHTML
32. an XML stylesheet file has the extension:
- *a) XSL
 - b) XSD
 - c) XMD
 - d) XHTML

Norrie, Huber, Piercy, McKeown
Introduction to Business Information Systems
Second Canadian Edition
TEST BANK
Tech Guide E

1. Which of the following is NOT a benefit of using virtual teams?
 - a) people can work from any place at anytime
 - b) expenses are reduced
 - *c) less flexibility for workers
 - d) none of the above
2. Virtual teams can benefit an organization in all of the following ways EXCEPT:
 - a) people can work from anyplace and at any time
 - b) recruitment of the best people regardless of their physical location
 - *c) increased expenses due to travel and sometimes facilities
 - d) greater flexibility for workers
3. A virtual team is also known as a/an:
 - a) Internet group
 - *b) geographically dispersed team (GDT)
 - c) local area network (LAN)
 - d) flash mob
 - e) none of the above
4. A team of the right people working in an aligned fashion in the “right” direction will be _____ the sum of its parts.
 - a) less than
 - b) equal to
 - *c) greater than
 - d) multiples of
5. The Wisdom of Teams states: “a [relatively] small number of people with complementary skills who are committed to a common purpose, performance goals and approach for which they hold themselves mutually accountable)” Who was one of the authors?
 - a) Tim Berners-Lee
 - b) Henry Ford
 - c) Dr. Meredith Belbin
 - *d) Douglas K. Smith
 - e) None of the above
6. As Katzenbach and Smith point out, the entire workforce of any large and complex organization is _____ a team, despite how often that label is offered up.
 - a) always
 - *b) never
 - c) sometimes
 - d) under the right circumstances
7. Team members operate _____ rather than independently, which is another important distinction between a team and a work group.
 - a) remotely
 - *b) interdependently
 - c) alone
 - d) together
 - e) co-dependently

8. The team is composed of individuals who perform basically the same actions. This describes which type of team?

- *a) independent
- b) natural work group
- c) project
- d) functional
- e) none of the above

9. The work of one team member has little to no direct effect on the performance of the other team members. This describes which type of team?

- *a) independent
- b) natural work group
- c) project
- d) functional
- e) none of the above

10. The team reports to the same manager, works in the same department, or works together in the same area to contribute to group goals. This describes which type of team?

- a) independent
- *b) natural work group
- c) project
- d) functional
- e) none of the above

11. The team comes together temporarily for a specific assignment and when completed, disbands. This describes which type of team?

- a) independent
- b) natural work group
- *c) project
- d) functional
- e) none of the above

12. The team is composed of members from the same department, such as customer service) This describes which type of team?

- a) independent
- b) natural work group
- c) project
- *d) functional
- e) none of the above

13. The team is composed of members from varying disciplines, such as sales, parts, and manufacturing, responsible for supporting a unit or position, such as a field service engineer. This describes which type of team?

- a) independent
- b) natural work group
- c) project
- d) functional
- *e) none of the above

14. The team works in various facilities or locations, coming together “virtually” through technology (e.g., conference calling, video conferencing, VoIP), describes which type of team?

- a) independent
- b) natural work group
- c) project

- d) functional
 - *e) none of the above
15. _____ is an ability to accomplish a task.
- *a) skill
 - b) agility
 - c) knowledge
 - d) wisdom
16. _____ refers to producing an outcome with minimal waste or effort.
- *a) efficiency
 - b) effectiveness
 - c) economy
 - d) ecological
17. _____ is more about having a definite or desired effect.
- a) efficiency
 - *b) effectiveness
 - c) economy
 - d) ecological
18. _____ skills include expertise or functional knowledge, such as a chartered accountant's accounting knowledge or an experienced programmer's IS knowledge.
- *a) Technical
 - b) Problem-solving
 - c) Interpersonal
 - d) Complementary
19. _____ skills include investigating and analyzing, as well as decision making and implementing.
- a) Technical
 - *b) Problem-solving
 - c) Interpersonal
 - d) Complementary
20. _____ skills are required for effective relationships between team members and include the ability to compromise and build consensus.
- a) Technical
 - b) Problem-solving
 - *c) Interpersonal
 - d) Complementary
21. Listening and supporting are two other essential _____ skills.
- a) technical
 - b) problem-solving
 - *c) interpersonal
 - d) complementary
22. It is best when a team is composed of members who have _____ skills from both areas. It is a matter of balance, which is a key contributor to solid team performance.
- a) technical
 - b) problem-solving
 - c) interpersonal
 - *d) complementary
23. According to _____, a role is a "tendency to behave, contribute and interrelate with others in a particular way."

- a) Tim Berners-Lee
 - b) Henry Ford
 - c) Dr. Meredith Belbin
 - *d) Douglas K. Smith
 - e) None of the above
24. Which of the following is not one of Belbin's Team Roles?
- a) action-oriented roles
 - b) people-oriented roles
 - *c) actor roles
 - d) cerebral roles
25. Which of Belbin's Team Roles is described as: "Extroverted, enthusiastic, communicative; explores opportunities and develops contacts"?
- a) action-oriented roles
 - *b) people-oriented roles
 - c) actor roles
 - d) cerebral roles
26. Which of Belbin's Team Roles is described as: "Creative, imaginative, unorthodox; solves difficult problems"?
- a) action-oriented roles
 - b) people-oriented roles
 - c) actor roles
 - *d) cerebral roles
27. Which of Belbin's Team Roles is described as: "Painstaking, conscientious, anxious; searches out errors and omissions and delivers on time"?
- *a) action-oriented roles
 - b) people-oriented roles
 - c) actor roles
 - d) cerebral roles
28. Elaborator is what type of team role?
- a) process (relating)
 - b) process (doing)
 - *c) task (doing)
 - d) task (relating)
29. Clarifier is what type of team role?
- a) process (relating)
 - b) process (doing)
 - *c) task (doing)
 - d) task (relating)
30. Which team role uses humour or suggests breaks?
- *a) tension reliever
 - b) compromiser
 - c) harmonizer
 - d) encourager
 - e) gatekeeper
31. Which team role is willing to yield a point of view?
- a) tension reliever
 - *b) compromiser
 - c) harmonizer

- d) encourager
 - e) gatekeeper
32. Which team role mediates/reconciles?
- a) tension reliever
 - b) compromiser
 - *c) harmonizer
 - d) encourager
 - e) gatekeeper
33. Which team role uses praise and support?
- a) tension reliever
 - b) compromiser
 - c) harmonizer
 - *d) encourager
 - e) gatekeeper
34. Which team role keeps communication open?
- a) tension reliever
 - b) compromiser
 - c) harmonizer
 - d) encourager
 - *e) gatekeeper
35. Which dysfunctional role deflates others' status or disagrees aggressively?
- *a) aggressor
 - b) joker
 - c) blocker
 - d) withdrawer
 - e) none of the above
36. Which dysfunctional role criticizes or attacks others?
- a) aggressor
 - b) joker
 - c) blocker
 - d) withdrawer
 - *e) none of the above
37. Which dysfunctional role holds onto attitudes, mentions unrelated experiences, or returns to already resolved topics?
- a) aggressor
 - b) joker
 - *c) blocker
 - d) withdrawer
 - e) none of the above
38. Which dysfunctional role refuses to participate?
- a) aggressor
 - b) joker
 - c) blocker
 - *d) withdrawer
 - e) none of the above
39. Which dysfunctional role boasts or talks excessively?
- a) aggressor
 - b) topic jumper

- c) blocker
 - d) withdrawer
 - *e) none of the above
40. Which dysfunctional role changes the subject, sometimes frequently or randomly?
- a) aggressor
 - *b) topic jumper
 - c) blocker
 - d) withdrawer
 - e) none of the above
41. Which dysfunctional role diffuses the energy by telling ill-timed or off-topic jokes?
- a) aggressor
 - b) topic jumper
 - c) blocker
 - d) withdrawer
 - *e) none of the above
42. According to_____, “Coming together is a beginning, staying together is progress, and working together is success.”
- a) Tim Berners-Lee
 - *b) Henry Ford
 - c) Dr. Meredith Belbin
 - d) Douglas K. Smith
 - e) None of the above
43. Perhaps the most widely accepted model of team development is Tuckman’s Stage Model. Which of the following isn’t one of the stages?
- a) forming
 - b) storming
 - *c) abnorming
 - d) performing
 - e) adjourning
44. Wherever possible, every team should aim to reach the _____ stage, the ideal state where a team is fully developed, deployed, and productive)
- a) forming
 - b) storming
 - c) norming
 - *d) performing
 - e) adjourning
45. The sooner the team can come to know one another’s skills and expectations and begin to define their tasks and roles, the sooner members will experience the possibility of becoming a productive unit. Which stage is this?
- *a) forming
 - b) storming
 - c) norming
 - d) performing
 - e) adjourning
46. Some testing of one another’s commitment and attitude is normal at which stage of Tuckman’s Stage Model?
- *a) forming
 - b) storming

- c) norming
- d) performing
- e) adjourning

47. The _____ stage can bring a real sense of spinning their wheels, or even going backward.

- a) forming
- *b) storming
- c) norming
- d) performing
- e) adjourning

48. Little progress is being made as certain members compete for control at this stage. Which is it?

- a) forming
- *b) storming
- c) norming
- d) performing
- e) adjourning

49. By the time the team reaches the _____ stage, members have gotten to know one another and find they are now able to work effectively together.

- a) forming
- b) storming
- *c) norming
- d) performing
- e) adjourning

50. At the _____ stage, the team is making progress toward its goal with efficiency and effectiveness.

- a) forming
- b) storming
- c) norming

hzzled

- *d) performing
- e) adjourning

51. Members are legitimately excited about their accomplishments, as they use everyone's strengths to analyze and overcome obstacles. Which stage is this?

- a) forming
- b) storming
- c) norming
- *d) performing
- e) adjourning

52. In this case, a new situation is the happy completion of the team's mandate, as well as the need to disband this particular team configuration. Which stage is this?

- a) forming

- b) storming
- c) norming
- d) performing
- *e) adjourning

53. The process of _____ must be properly marked, offering room for both the sadness of closure and the rightful celebration of a job well done)

- a) forming
- b) storming
- c) norming
- d) performing
- *e) adjourning

54. Organizational agility = _____ of insight + _____ of execution

- a) speed; quantity
- b) speed; quality
- *c) quality; speed
- d) quantity; speed
- e) none of the above

55. All six critical success factors for a team _____ be present in order for a team to advance to higher levels of development.

- a) may
- b) cannot
- *c) must
- d) will
- e) should

56. Team members see themselves as belonging to a team rather than as individuals who operate autonomously. This describes:

- *a) commitment
- b) purpose

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- c) communication
- d) involvement
- e) process

57. The team understands how it fits into the overall business or the organization. This describes:

- a) commitment
- *b) purpose
- c) communication
- d) involvement
- e) process

58. _____ refers to the way that members handle conflict, decision making, and day-to-day interactions. This describes:

- a) commitment
- b) purpose
- *c) communication
- d) involvement
- e) process

59. Contributions are respected and solicited, and a real consensus is established before committing the team to action. This describes:

- a) commitment
- b) purpose
- c) communication
- *d) involvement
- e) process

60. The _____ should include problem-solving tools, planning techniques, regular meetings, meeting agendas and minutes, and accepted ways of dealing with problems. This describes:

- a) commitment
- b) purpose
- c) communication
- d) involvement
- *e) process

61. Solid _____ allow a team to uncover hidden agendas, because the team has agreed to give everyone a voice in how they arrive at decisions and solutions.

- a) commitments
- b) purposes
- c) communications
- d) involvements
- *e) processes

62. As _____ builds, teams feel more comfortable to take risks and try new ideas.

- a) commitment

hzzled

- b) purpose
- c) involvement
- *d) trust
- e) none of the above

63. In effect, the code of _____ that results from this commitment-building process becomes like a social contract that obliges team players to follow it.

- a) ethics
- *b) conduct
- c) order
- d) commitment
- e) none of the above

hzzled

The data model of a health centre is shown below. In this centre, a therapist admits a patient who requires a treatment. Depending on their health problems, patients are given a room in one of the many units (e.g., chiropractic, physiotherapy, acupuncture, etc.). Each unit is located on a different floor and has many rooms. All rooms are private, that is, there is only one patient per room.

Complete the following requirements.

- Underline the Primary Keys in the data model below
- Circle the Foreign Keys in the data model below
- Create (draw) the link between the tables and show their cardinality

Therapist Patient Room Unit

Therapist ID

Name Room # Unit Name

Name

Admit Date Phone # Floor

Number

Specialty

1 M Patient ID M 1 Unit Name M 1 Phone #

Date of Birth

Therapist ID

Email

Room #

Date of Birth

Question 1

- Twitter, Facebook and MySpace. We should monitor for organized attacks that can damage our brands in these social networks.
- This is when something spreads online from its origin to every corner in the world.

Question 2

a) Two project management scheduling tools are PERT and Gantt charts. PERT stands for Program Evaluation and Review Technique. This technique creates allows to derive an overall project time estimate and identifies critical path. Gantt charts are grid charts that show project activities as rows and time units (such as weeks and months) as columns. The duration of each activity is shown as a horizontal bar in each row to clearly show the relationship of activities on the project.

b) CASE tools are computer-aided software engineering tools that automate many of the tasks required in a systems development effort. Benefits of CASE tools are:

- Increased productivity: There is automation of tedious systems development activities, which saves time.
- Improved quality: CASE tools can reduce or eliminate errors in specification and design.
- Improved documentation: CASE tools help keep documentation current, reducing misunderstandings.

- Reduced system maintenance costs: CASE tools reduce the cost of keeping documentation current.
- c). Open-source software is a form of freeware available to anyone in a form that can be freely modified. Open-source software development is a collaborative process with developers around the world using the Internet to keep close contact to download and submit new updates to the software.
- d. Two advantages of open-source software are:
 - The initial cost to purchase the code is zero.
 - Changes to the code can be made in-house or by contractors to suit the specific needs of the business. One disadvantage of open-source software is that there is no guaranteed support by the software developer if the software fails to perform properly.

Question 3

Established in 1976 in Cupertino, California, Apple Inc. designs and markets computer hardware and software. It operates 357 retail stores in 10 countries and online stores. It is the largest publicly traded company in the world by market capitalization and the largest technology company in the world by revenue and profit. Fortune magazine named Apple the most admired company in the world in 2008, 2009, and 2010.

A cornerstone of Apple's business model revolves around products that are simple and elegant, that work together without any major problems. The way that Apple accomplishes this goal is with a combination of talented designers and total control over the product. Every Apple product ships only with apple software. Apple, like other IT industry hardware giants, such as Cisco Systems and Hewlett-Packard, were able to separate design and production using computerbased models and modular components. Apple's computers are designed in California, but manufactured in Shenzhen, China, by Taiwanese industrial giants Foxconn and Inventec. When a consumer chooses to purchase a computer on the online Apple Store, he starts by creating an account on the Apple Store website. He is then presented with web pages in the language of his choice. He can choose and customize products, even get a product engraved. Once the order is completed, he can pay using any major credit card. For repeat customers, a one-click option is also available to expedite the process. For a first-time customer the whole process can be completed in a matter of a few minutes, giving customers the ability to move from thought to action nearly instantly. After the order is validated, the product is shipped within 2-3 days from the nearest storage depot to the customer. Storage depots exist in all regions of the globe. They are managed by an international third party logistics and shipping company, FedEx. If the product is not available at the storage depot or if a highly specialized (like a server or some of the high-end models) or a customized product is ordered (for example with engraving), an electronic order is sent to the third-party factory. A custom product is then prepared and then shipped. In such cases, Apple commits to have the product delivered to the customer in no more than in 3-4 weeks. The customer has the ability to track the status of his order at all times. Once the product is received, the customer may also use the Apple website for after-sales support and warranty issues. When software is purchased the process is similar, but the product is shipped electronically in a matter of a few minutes after the order is validated.

Questions:

1- What e-commerce advantage is illustrated in this case?

Answer: frictionless transactions—the ability of the consumer to move from thought to action (i.e., buying to instantly fulfilling the product)

2- What business model is implemented by Apple ?

Answer: Manufacturer Direct, Make and sell products directly to consumer

3a- When a customer orders a product from the on-line Apple store, what type of e-commerce is

this?

Answer: B2C

3b- When Apple sends an electronic orders to Foxcom for a product to be custom-built and shipped to a customer, what type of e-commerce is this?

Answer: B2B

4- What primary value chain activities are outsourced by Apple ? (name all of them and Identify if they are primary or support activities)

Answer: inbound logistics, operations (production), outbound logistics

5- What support value chain activities are outsourced by Apple ?

Answer: None

6 a- Name 2 benefits for customers of the business model presented in this case ?

Answers: see table below

6 b- Name 2 limitations for customers of the business model presented in this case ?

Answers: see table below

6b Name 2 benefits for Apple of the business model presented in this case ?

Answers: see table below

6 a- Name 2 limitations for Apple of the business model presented in this case ?

Answers: see table below

- **An advertising company that uses many freelance artists and designers from all over the world is considering eliminating its in-house design department and moving to remote computing using virtual project teams. Discuss the challenges of managing remote workers.**
 - Managers need to have greater trust in remote workers. They monitor outcomes instead of the process of completing a task.
 - Companies need to allocate the costs of dedicated connections and equipment for remote workers to connect to the office.
 - Security of data transmission must be considered by using VPN.
 - Policies should be developed for maintaining and supporting remote workers.
- **Describe two advantages and two disadvantages that a large, global, multinational corporation can experience with implementing an SAP ERP solution for its warehousing and distribution needs.**
 - Advantages
 - Efficiency improvements
 - Just-in-time inventory
 - Better “real-time” data availability for distribution
 - Disadvantages
 - Cost

- Customization
- Change management

List the tables and data fields in an ERD using the following requirements:

- An INVOICE is written by a SALESREP. Each sales representative can write many invoices, but each invoice is written by a single sales representative.
- The INVOICE is written for a single CUSTOMER. However, each customer can have many invoices.
- An INVOICE can include many detail lines (LINE), each of which describes one product bought by the customer.
- The product information is stored in a PRODUCT entity.
- The product's vendor information is found in a VENDOR entity.

Identify the Primary Keys

Include the foreign keys that are required to implement the relationships



A computer network that is spread out over a large geographic area is known as a:

- a) CAN
- b) LAN
- c) PAN
- d) WAN
- d) WAN

Hard drive, CDs/DVDs, flash drive are all examples of _____.

- a. Memory Hardware
- b. Storage Hardware
- c. Communications Hardware
- d. System Software
- b) Storage Hardware

Disadvantages of file systems include all of following EXCEPT:

- a. Data Inaccessibility
- b. Poor File Management

c. Data Dependence

d. Data Overwrite

d) Data Overwrite

Which of the following is not a phase of IS development? (Chapter 6: Slide 14 Medium)

a. Inception

b. Construction

c. Transition

d. Retirement

e. None of the Above

e) None of the Above

TRUE or FALSE: Lower prices, greater searchability, ability to touch, feel, and smell products to purchase, and fast download speeds are all benefits of B2C E-Commerce.
False

What is the ability of a nation to move towards an economy that relies more on computer technology?

a. Globalization

b. E-readiness

c. Strategic Technology

d. ITC

b) E-readiness

What is the name of out sourcing by a company to another country?

a. Offshoring

b. out-housing

c. in-housing

a) Offshoring

What is the last stage of an IS life cycle where the system loses its value?

a. Retirement

b. Transition

c. Inception

a) Retirement

Who is charged with the governance of most IT and IS in most businesses?

a. CFO

b. CAO

c. CEO

d. CIO

d) CIO

TRUE or FALSE, Based on Ron Swift's presentation, a company 'segments' their customers in order to achieve greater costs savings and sales.

True

True or False: When data remain on the client machine for a period of time, this is a persistent cookie.

True

Open Office is what type of program?

a. Data Management

b. Presentation

c. Word Processor

d. Spreadsheet

C

True or False: Explicit Knowledge is Knowledge that is within people that they gain through experience, insight, and discovery

False

This adds insight and ethics to the data-information-knowledge continuum

- A. Knowledge
- B. Data
- C. Wisdom
- D. Information

C

This is a special form of output created by a business process that is returned to the system

- A. Value Chain
- B. Feedback
- C. Support Activities
- D. Competitive Advantage

B

If you are having a problem with a computer on campus you should not call EITS. [guest speaker presentation, easy]

- a) True
- b) False

B

The applications studyblue.com and flashcarddb.com allow one to both make and view flashcards online. [bonus application presentation, easy]

- a) True
- b) False

A

Which of the following is not an information characteristic of the CARROTS model? [chapter 3, slide 15, moderate]

- a) Accurate
- b) Timely
- c) Objective
- d) Synthesis
- e) Complete

D

Automating uses technology to perform tedious or repetitive tasks faster, cheaper, more consistently, and with greater accuracy. [chapter 4, slide 21, moderate]

- a) True
- b) False

A

Which of the following computer types has a large relative processing power with a purpose of organizational processing? [chapter 5, slide 4, hard]

- a) Server Farms
- b) Supercomputer
- c) Mainframe
- d) Personal Computer (PC)
- e) Embedded Processors

C

Match the hardware components with their definition. [chapter 2, slide 3, moderate]

Column A

- a. Processing
- b. Memory
- c. Input
- d. Output
- e. Storage

Column B

- A. provides the interface used to retrieve information from a device
- B. stores data, information, and instructions for the long term
- C. directs execution of instruction and the transformation of data
- D. provides the interface used for data entry into a device
- E. temporarily stores data and instructions before processing

aC, bE, cD, dA, eB

Which of the following is NOT a disadvantage of leasing an IS? [chapter 6, slide 11, hard]

- a) No competitive advantage
- b) No control over features
- c) Can get bad contract
- d) Requires IS staff with time and development knowledge
- e) Dependence on vendor

D

_____ is a marketing message that a business personalizes for each potential customer's interests based on searching, browsing, or buying habits, e.g. Amazon.com. [chapter 7, slide 16, moderate]

- a) Personalization
- b) Mass customization
- c) Customization
- d) All of the above
- e) None of the above

A

Which of the following is not one of the 7 phases of IS development? [chapter 6, slide 13, moderate]

- a) Inception
- b) Elaboration
- c) Analysis
- d) Construction

C

Which of the following is not one of the four primary components of a typical e-commerce site? [chapter 8, slide 24, hard]

- a) The account payable system
- b) The merchant account
- c) The payment gateway
- d) The security system

A

A merchant account is a company that provides a network to process encrypted transactions from a merchant's Web site. [chapter 8, slide 27, moderate]

- a) True
- b) False

B

XML stands for _____. [chapter 8, slide 37, easy]

- a) eXternal Media Language
- b) eXternal Multi-Locator
- c) eXtensible Markup Language
- d) eXtremely Moderate Language

C

True or False: Data Redundancy is a disadvantage of file systems. (Chapter 5, slide # 9, easy)

Answer: True

_____ is a knowledge work activity that requires you to organize the results from discovery activities.

- a. Transforming
- b. Analysis
- c. Synthesis
- d. None of the Above

(Chapter 3, slide # 4, moderate)

Answer: A

Which application presented in class allows you to chat and participate in video messaging with other(s) online for free? [Application presentation, easy]

- a. Pandora
- b. Skype
- c. Evite
- d. Centsports

ANSWER: B

The guest speaker Ron Swift, from the Teradata Corporation, addressed the following during his lecture: [Guest speaker, moderate]

- a. data warehousing, life-cycle management, advantages in using I/S
- b. client technology support, management for desktops and computer labs, free UGA computer resources
- c. importance of DIK (data, info, knowledge), differences between hardware and software, the value chain
- d. I/S consulting, technologies involved with consulting, careers in I/S consulting

ANSWER: A

The network interface card (NIC) is a type of communications hardware. [Ch.2, Pg.35, easy]

- a. true
- b. false

ANSWER: A (TRUE); provides the physical connection between the computer and a local network

The OS software performs a/some main task[s]. What are/is they/it? [multiple choice, chapter 2 page 38, difficult]

- I. Managing the hardware and software resources of a computer
- II. Providing a stable and consistent interface between application and programs and

the hardware.

III. Provides additional tools that you can use to maintain and service your system.

- a. I
- b. I & III
- c. II
- d. I & II
- e. I, II, & III

Answer: d; III relates to utility software.

The knowledge work activity that an employee would need to use when finding weekly sales data for a company and its competitors is... [chapter 3, slide 5, page 63, easy]

- a. Analysis
- b. Transformation
- c. Communication
- d. Discovery

Answer: d.

3. Which is an example of automating? [chapter 4, slide 21, page 105, moderate]

- a. Using subscription data to forecast demand and to better schedule inbound logistics and outbound activities.
- b. Using online subscription for newspaper to reduce printing and handling costs of paper-based, mailed subscription forms.
- c. Using transaction data to understand subscription process
- d. Developing a unique competency for delivering targeted content to various customer segments as identified by demographic and subscription data.

Answer: b.

What is a form of knowledge management that tries to capture and store the knowledge of a human expert? [chapter 5, slide 25, page 133, moderate]

- a. Relational database management systems (RDBMS)
- b. Structured Query Language (SQL)
- c. ExpertSystem
- d. Middleware

Answer: c.

What was the first life cycle model to gain wide acceptance among system developers? (Ch. 6, pg. 168, easy)

- a. Evolutionary model
- b. Waterfall model
- c. Logical Data model
- d. Exchange model

Answer: b

What is general formula for how a business is to use computer networks and information systems to compete in a global marketplace? (Ch.7, 204, moderate)

- a. Mobile commerce
- b. Procurement
- c. E-commerce strategy
- d. Privacy policy

Answer: c

E-commerce is the use of information systems, technologies, and computer networks to carry out Transactions in order to create or support the creation of Business Value.[Chapter7,Slide4,Moderate]

a. True

b. False

Answer: a

What is information on a Web page that may change depending on a number of factors? (Ch.8, pg.227, moderate)

a. Dynamic content

b. Static content

c. Persistent data

d. A cookie

Answer: a

Strategic sourcing involves forming a short-term relationship with another company and then setting prices through negotiation. [true/false, chapter 7, p. 214, easy]

a. True

b. False

Answer: b [false] it should be a long-term relationship

Leadership and Management of a business are directly accountable to its owners for proper operation and financial control of the organization is? (Ch.9, pg. 261, moderate)

a. IT governance

b. Global perspective

c. Global sourcing

d. Corporate governance

Answer: d

What was the promotion code given to UGA students for mytypeface.com? [bonus application presentation, moderate]

a. myuga2

b. myuga5

c. uga5

d. uga2

Answer: c

What Company did guest speaker Ron Swift work for?[Guest Speaker Ron Swift, Bioinfo, Easy]

a. Teradata Corporations

b. CNN Consultants

c. Xabyte Inc.

d. None of the above

Answer: a

What is an open system business model?

a) A model in which management power is pushed down through the system

b) A model in which inputs and outputs are transformed through constant environmental interaction

c) A model in which databases store information on the entities involved with the business process

d) None of the above

Answer: B

HTTP drops connections between client and server after processing a request.

a) True

b) False

Answer: A

One frequently used way of _____ is bringing together different pieces of data and information in order to form a complete picture of the situation.

- a) analysis
- b) discovery
- c) synthesis
- d) transformation
- c) synthesis

True or False: A tangible benefit is difficult to measure in monetary terms.

- a) true
- b) false
- b) false

Globalization does not do which of the following:

- a) stimulate economic growth
- b) lower prices for goods and services
- c) strengthens local communities
- d) destroys jobs in advanced countries
- c) strengthens local communities

Which one is NOT a disadvantage of File Systems?

- a.Data redundancy
- b.Data inaccessibility
- c.Poor file management
- d. Database administrators
- d. Database administrators

A USB flash drive is an example of [Chapter 2, slide 7, easy]:

- a. Software
- b. Storage
- c. RAM
- d. ROM

b. Storage

Software for which the code is freely available to anyone is:

- a. Proprietary
- b. Open
- c. Reference
- d. Productivity
- b. Open

4. What knowledge work activity will help you answer questions and gain understanding through a thoughtful investigation and examination to the available data, information, and knowledge?

- a. Synthesis

b. Transformation

c. Analysis

d. Discovery

c. Analysis

5. Which is not involved in a feasibility study?

a. technical analysis

b. financial analysis

c. organizational analysis

d. Inception

d. Inception

What does SAD stand for?

a) Systems Analysis and Design

b) Systems and Design

c) Systems Account Programming

d) Strategy Analysis and Design

a) Systems Analysis and Design

What is E-Commerce?

a. to buy and sell over the internet

b. use of information systems, technologies, and computer networks to carry out transactions in order to create or support the creation of business value

c. when people go to a store and buy something

d. only buying products that start with the letter "e"

b. use of information systems, technologies, and computer networks to carry out transactions in order to create or support the creation of business value

The language that guides the display of a requested page:

a) HTML

b) HTTP

c) XML

d) WWW

a) HTML

9. Hypertext organizes content into units that are connected using associations called:

a) Chains

b) Links

c) Blocks

d) Strands

b) Links

In Matt Gonzales's presentation, he mentioned that there is discounted software available for UGA students online :

- a. True
- b. False

a) true

Which application allows sharing of flashcards and wiki notes, communication with classmates, and helps you find a tutor?

- a. Studyblue.com
- b. Twitter
- c. Survey monkey
- d. Photobucket

a)

Is the following statement true or false:

The governance of Information Technology includes the distribution of Information technology decision-making rights and responsibilities among enterprise stakeholders.

- a) True
- b) False
- a) True

11. In Mr. Phillip Grossman's presentation, he described two real-world examples of the type of work a consultant in his field would be asked to do. In his Sprint PCS example, he explained that Sprint wanted to reduce the handling time on their call center calls to save money. The task required an analysis of all systems and processes that supported the call center, and the solution included improved information architecture and a _____ solution.

- a) database efficiency
- b) Information Technology management
- c) content/ knowledge management
- d) customer care
- c)

12. Which of the following applications, demonstrated in class, serves as a free, online social networking and micro-blogging service that enables users to "follow" celebrities and even President Barack Obama:

- a) Pandora
- b) iLike
- c) Facebook
- d) Twitter
- e) None of the above
- d)

_____ is a knowledge work activity that involves thoughtful investigation and examination of the available data, info, and knowledge.

- a) synthesis

- b)analysis
- c)communication
- d) transformation
- b) analysis

A _____ decision is one that involves some uncertainty or doubt about the outcome of it.

- a) structured
- b) unstructured
- c) semistructured
- d) relatively structured
- c) semistructured

The integration between Business and Technology creates which of the following:

- a. A network
- b. Business value
- c. A Knowledge Worker
- d. Megabyte
- b. business value

The two types of memory are _____, which is short-term memory; and _____, which is long-term memory.

- a. ROM; RAM
- b. RAM; ROM
- c. RIM; REM
- d. REM; RIM
- b. RAM; ROM

What does the acronym "CARROTS" stand for?

- a. Complete; Associated; Reliable; Random; Overt; Timely; Sustainable
- b. Creative; Accurate; Reliable; Relevant; Opportunity; Timely; Substance
- c. Complete; Accurate; Reliable; Relevant; Objective; Timely; Source
- d. Creative; Associated; Reliable; Relevant; Opportunity; Timely; Source
- c.

What does the acronym "CARROTS" stand for?

- a. Complete; Associated; Reliable; Random; Overt; Timely; Sustainable
- b. Creative; Accurate; Reliable; Relevant; Opportunity; Timely; Substance
- c. Complete; Accurate; Reliable; Relevant; Objective; Timely; Source
- d. Creative; Associated; Reliable; Relevant; Opportunity; Timely; Source
- c.

In a database, each table has an individual key called the _____.

- a. Foreign Key
- b. Map Key
- c. DBMS Key
- d. Primary Key
- d. primary key

Which statement below is NOT a "pro" of globalization?

- a. Lower prices for goods and services
- b. Stimulates economic growth
- c. Creates jobs
- d. Moves work to countries with fewer labor and environmental regulations
- d.

Which one of the following applications that was shown in class is used as an online studying device?

- a. Ilike
- b. Pandora
- c. Flashcard DB
- d. Study Pro
- e. None of the Above
- c. flashcard DB

7) A project is said to be what when the technology is available to solve the problem and a company is technically capable of acquiring and using the technology? [Chapter 6, Slide 6, Moderate]

- a. Technically Feasible
- b. Technically Available
- c. Financially Feasible
- d. Organizationally Feasible
- e. Technically Operationable
- a. technically feasible

8) When developing an IS, which method takes the longest time and has the highest cost, but provides a competitive advantage?

- a. Acquisition
- b. Building
- c. Stealing
- d. Leasing
- b. building

9) Match the following:

- 1. B2C a. Online equivalent of retail store as well as other services
- 2. B2B b. Use of online auctions like eBay or Yahoo! Auctions
- 3. B2G c. Electronic payment of taxes as well purchasing licenses
- 4. C2G d. Electronic exchanges between companies
- 5. C2C e. Online sales to government agencies as well as online

Payment of taxes

1a, 2d, 3e, 4c, 5b

10) Dynamic content, where a web page changes depending on a number of factors such as time and date, user profile, or browser location emerged in which generation of ecommerce?

- a. First Generation
- b. Second Generation
- c. Third Generation
- d. Fourth Generation
- b. second generation

11) Which of the following is NOT one of the Four Dragons?

- a. Singapore
- b. Taiwan
- c. Thailand
- d. Hong Kong
- c. thailand

What is an IS consultant?

- a. An experienced individual that is trained to analyze and advise a client in order to

help the client make the best possible choices.

- b. A person who fixes computers
- c. A person who is in charge of the technology department at a Computer Store
- d. A person who designs software

a

1. According to Mr. Swift's presentation, which is NOT one of the many analytical applications? (Mr. Swift's presentation, slide 34 of 56, difficult)

- a. Propensity to buy
- b. Propensity to save
- c. Propensity to respond
- d. Propensity to default

Answer: b

2. Using the analogy CARROTS as a knowledge worker, the letters stand for Completeness, Accuracy, Reliable, Responsive, Objective, Timely, and Source. (Chapter 3, Slide 15, easy)

- a. True
- b. False

Answer: b

3. The spiral model of the book goes in this order from lowest to highest: (Chapter 1, Slide 3, easy)

- a. Business partners, organizational, individual
- b. Organizational, individual, business partners
- c. Individual, organizational, business partners
- d. None of the above

Answer: c

4. A database management system(DBMS) is used for: (Chapter 2, page 40, moderate)

- a. Designing, creating, updating, and querying data.
- b. Creating documents composed of text, images, and supporting graphics.
- c. Managing personal information such as to-do lists, schedules, and electronic mail.
- d. Performing general calculations and analyses, such as financial analysis, budgeting, and forecasting.

Answer: a

5. Match the following networks to the size of the corresponding network. (Chapter 5, slide 6, easy)

Column A: Column B:

- a. PAN A. Large geographic area
- b. LAN B. Small office
- c. WAN C. Global
- d. Internet D. Building

Answer: a-B, b-D, c-A, d-C

6. Prices that are set through negotiation in a long-term relationship with a company known to the buyer is known as: (Chapter 7, slide 32, difficult)

- a. Spot buying
- b. Outsourcing
- c. Strategic sourcing
- d. Consumer relation negotiation

Answer: c

7. A stakeholder analysis should begin as part of the feasibility study and should be continued during the course of the project. (Chapter 6, slide 9, moderate)

- a. True
- b. False

Answer: a

8. Businesses often used client-scripting for: (Chapter 8, page 235, difficult)

- a. Persistent data
- b. Web holding
- c. Form controls
- d. Data validation

Answer: d

9. Match the four generations of E-commerce: (Chapter 8, slide 4, moderate)

Column A: Column B:

- a. First generation A. Integration with external partners
- b. Second generation B. Dynamic content
- c. Third generation C. Static content
- d. Fourth generation D. Ability to support transactions

Answers: a-C, b-B, c-D, d-A

10. Nearshoring is outsourcing to a business partner located outside your country but in the same general geographic area as your business. (Chapter 9, page 267, easy)

- a. True
- b. False

Answer: a

11. Which of the following is NOT a B2B business model? (Chapter 7, slide 33, moderate)

- a. Exchange
- b. Community
- c. One-to-one
- d. Company-centric

Answer: b

12. Which of the following is not a music application? (Bonus application, easy)

- a. Pandora
- b. iLike
- c. Skype
- d. All are music applications

Answer: c

Anyone outside of a company can access the 'best practices' data of a company

- a. True
- b. False
- B. False

What are the two important outputs of a business process?

- A. Inputs and Outputs
- B. Data and Knowledge
- C. Products and Services
- D. HTML and HTTP
- C. Products and Services

1. Which of the following applications, demonstrated in class, is a social networking site in which "tweets" update your friends based on "what you are doing". (bonus application presentation, easy)

- a) skype b) centsports c) twitter d) rotten tomatoes
- e) none of the above

Twitter

2. _____ knowledge is knowledge that is within you and is gained through experience, insight, and discovery. (Chapter 1, Slide 6 of Chapter 1 Powerpoint, easy)

- a) tacit b) experimental c) explicit d) implicit

Tacit

3. If a global company wanted their computer networks in the U.S. to be connected to their computer networks in Japan, they would need to use a _____. (Chapter 2, Slide 14 of Chapter 2 Powerpoint, moderate)

- a) PAN b) WAN c) LAN d) CAN

WAN

4. Which of the following introduces uncertainty into the individual decision-making process?(Chapter 3, Slide 14 of Chapter 3 Powerpoint, moderate)

- a. structured decision
- b. unstructured decision c. semi-structured decision d. uncertain decision

Semi-Structured

5. Stakeholders may be which of the following: (Chapter 4, Slide 4 of Chapter 4 Powerpoint, easy)

- a) internal only b) external only c) both internal and external d) none of the above

Both internal and external

6. The _____ usually leads to the organization's information and technology efforts, especially as it relates to the creation of business value. (Chapter 9, page 264, moderate)

- a. CEO
- b. CIO c. CFO
- d. COO

CIO

7. _____ refers to the strategic decision made by a business to bring various services or functions 'back-in-house'(Chapter 9, page 266, hard)

- a. Global sourcing
- b. In-sourcing c .Onshoring
- d. Nearshoring e. Offshoring

In-sourcing

8. Ron Swift is the Vice-president of Terabyte Inc. (guest speaker presentation, moderate)

- a. True
- b. False

False, Teradata

9. What generation of e-commerce is characterized by increasing integration with external partners over the Web and allowing increased transactions between two web partners? (Chapter 8, page 227, moderate)

- A. First generation
 - B. Second generation
 - C. Third generation
 - D. Fourth generation
- Fourth generation

10. A small bit of data, usually created by programs running on the server, stored on the client machine, and passed back and forth in the HTTP request and response is a(n) (Chapter 8, page 235, moderate)

- A. persistent data
 - B. scripting language
 - C. cookie
 - D. applet
- Cookie

11. This group handles unique aspects of the project.

- a. Project management
- b. Analyst
- c. Specialist
- d. Public Relations

Specialist

12. A business model defines how a company will meet the needs of its customers while making a profit.

- a. True
 - b. False
- True

Which of the following is not a stage of IS development?

- A. Inception
 - B. Retirement
 - C. Motivation
 - D. Construction
- C. Motivation

Ron Swift showed a "Customer Lifecycle Management" diagram and listed the key events. Fill in the blanks according to his chart. (teradata presentation, slide 23)

- 1. Birth
- 2. Graduation
- 3.
- 4. Marriage
- 5. Remarriage
- 6.
- 7. Divorce
- 8.
- 9. Retirement
- 10.

- A. New Job, Children, Child Leaving, Death
 - B. Engagement, Separation, Child Leaving, Death
 - C. New Job, Separation, Death, Child Leaving
 - D. none of the above
- C. New Job, Separation, Death, Child Leaving

What is a disadvantage for using Pandora?

- A. You can't stop a song you don't like from playing.
- B. You can't pick a specific genre to listen to.

- C. You have to listen to the whole song before going to the next one.
- D. None of the Above.
- D. None of the Above

Matching:

Applet

Plug-In

ActiveX technology

- A. A small software module that can work with the browser.
- B. A small program that a browser can download and execute.
- C. Used for sharing information among different technologies.

Applet-B

Plug-In-A

ActiveX technology-C

1. A knowledge that is readily codified is _____.
- a. explicit knowledge
 - b. initial knowledge
 - c. tacit knowledge
 - d. knowledge work
 - e. all of the above

A

2. Which of the following is an example of input hardware?
- a. printer
 - b. network interface card
 - c. microprocessor chip
 - d. keyboard
 - e. both a and d

D

Which one of the following is not a type of Information System? [Chapter 1, page 14, easy]

- a. TPS (Transaction Processing System)
- b. DSS (Decision Support System)
- c. SIS (Security Information System)
- d. CRM (Customer Relationship Management)
- e. MIS (Management Information Systems)
- f. ERP (Enterprise Resource Management Systems)

C

A business can use automating to learn new ways to increase or transform its capabilities and find better ways to manage its resources [Chapter 4, page 102, moderate].

- a. True
- b. False

False

Which of the following provides financial information to the organization's financial managers?

- a. Accounting IS

- b. Financial IS
- c. Marketing IS
- d. Human Resource IS
- e. Manufacturing IS

B

Match the following [Field Guide A, pgs 305-315, moderate]:

Column A Column B

- a.RAM A. Input device
 - b.USB Port B. Memory
 - c.Printer C. Storage
 - d.Webcam D. Output Device
- aB, bC, cD, dA

What is the function of server-side programming?

- a. What the server displays on the monitor of the user's computer, rather than the HTML code
- b. When programs run on the Web server rather than the computer itself to promote dynamic interaction
- c. When the server encrypts sensitive information input from the user's computer
- d. When a programmer actively writes code for use on a server or website

B

True or False: The First Generation of E-Commerce is the most advanced, including dynamic content and complex automation.

False.

What structure is most commonly used in e-commerce transactions?

- a. N-tier
- b. Fat client
- c. 2-tier
- d. Thin client

A

Which of the following are NOT one of the four primary components of a typical e-commerce site?

- A. The Merchant Account
- B. The Payment Gateway
- C. The Shopping and Ordering System
- D. The Customer Account
- E. The Security System
- D. The Customer Account

Which of these is not an advantage of e-commerce transactions?

- a. Higher information density
- b. Customization
- c. Global outreach
- d. Personal Interaction

D

What is the function of the Interorganizational System?

- a. Streamline the interaction between the business itself and its suppliers
- b. Provide additional accountability to each level of the value chain

- c. Automates the comparison of the purchase order, receipt of goods, and invoice
- d. Encourage efficiency between each member of a matrix system

C

Discerning the feasibility of an Information System involves which of these analyses?

- a. Technical Feasibility
- b. Geographic Feasibility
- c. Commercial Feasibility
- d. Production Feasibility

A

What types of industries are using MIS to help their business grow? [Swift presentation, page 10 ppt, easy]

- a. Retail
- b. E-Commerce
- c. Travel
- d. Casino
- e. All of the Above

E

What advantage does a lower tier country have over a higher tier in terms of outsourcing?

- a. Increased population size leads to higher competition for incoming jobs
- b. Greater education opportunities makes individuals more attractive to potential employers
- c. Lower labor costs, so more jobs will be brought into the country rather than removed
- d. Higher numbers on "e-readiness" rankings means that the country is likely to become technologically advanced in the near future

A

Which type of application allows users to send invitations for parties along with sending reminders? [student presentation, moderate]

- a. Meeting Wizard
- b. Evite
- c. Pandora
- d. Facebook Marketplace

B

What is the function of Teradata?

- a. Provide secure internet networks for client corporations
- b. Streamline the link between online customers and client products
- c. Process data on both potential and already-existing customers for client companies
- d. Storage of non-essential data into a data warehouse for later access

D

What is a major limitation of Surf-the-Channel?

- a. Quality of videos significantly reduced as compared to purchased videos
- b. Links are user-posted, so they are not guaranteed to be accurate or safe
- c. Site only uses illegal video sites as clients
- d. Site requires entry of sensitive data over a non-secure HTML connection

B

What is an example of B2C? [Chapter 7, page 198, moderate]

- a. desk
- b. manual
- c. tax return
- d. CD

D

What is software that links applications that use dissimilar software or hardware platforms? [Chapter 5, page 136, easy]

- a. Application software
- b. web service
- c. middleware
- d. ERP

C

Which one of these is a search engine? [Chapter 7, page 211, easy]

- a. Google
- b. Yahoo
- c. MSN
- d. all of the above

D

Which of the following types of application software is used for performing general calculations, such as financial analysis, budgeting, and forecasting? [Chapter 2, page 40, easy]

- a. Database management system
- b. Document preparation software
- c. Electronic spreadsheet software
- d. Document preparation software

C

Which of the following is NOT a component of project management? [Chapter 6, page 175, moderate]

- a. Time management
- b. Quality management
- c. Budget management
- d. Project scope management

C

Which of the following is not an affect of using E-commerce? [Chapter 7, page 202, moderate]

- a. Enhancing collaboration
- b. Multiplying market niches
- c. Changing marketplace drivers
- d. Increasing barriers to entry

D

The sequence of first-generation e-commerce activities provides what type of network?
[Chapter 8, page 228, moderate]

- a. Client/Server
- b. Static content
- c. Dynamic content
- d. Java

A

1. Which of the following is NOT an input in the IPO model? [chapter 1, slide 13-14, moderate]

- a. Business Value
- b. Information
- c. Knowledge
- d. Data
- e. Decisions

A

2. ROM is associated with short-term memory storage. [chapter 2, slide 5, easy]

- a. True
- b. False

B

3. Match the following with it's correct definition: [chapter 3, slide 14, easy]

- a. Decision
- b. Structured Decision
- c. Semi-structured Decision
- d. Unstructured Decision

- i. A choice that involves some uncertainty or doubt about the outcome of it.
- ii. A choice about actions to take (or not to take) in a given decision.
- iii. A choice that can be programmed; it is routine or repetitive.
- iv. A choice that involves a significant amount of uncertainty about the outcome associated with a choice.

a) ii. b) iii. c) i. d) iv.

4. If a company wanted it's decision making to occur lower in its organization system and closer to the customer, which organization structure would it choose? [chapter 4, slide 12, hard]

- a. Functional
- b. Decentralized
- c. Matrix
- d. Linear

C

5. Which of the following is NOT a disadvantage of file systems? [chapter 5, slide 9, moderate]

- a. Data Redundancy
- b. Data Dependence
- c. Data Inaccessibility

- d. Poor File Management
- e. Data Independence

E

6. Which of the following is NOT one of the three parts of a feasibility study? [chapter 6, slide 5, hard]

- a. Technical Analysis
- b. Organizational Analysis
- c. Stakeholder Analysis
- d. None of the Above
- e. All of the Above

C

7. Entity-Relationship Diagram (ERD), is a model used in what kind of design? [chapter 6, page 171, moderate]

- a. Data Warehouse
- b. File Processing
- c. Relational Database
- d. Querying
- e. Communications

C

8. An extranet is a collaborative network that uses Internet technology to link businesses with their customers. [chapter 7, slide 46, moderate]

- a. True
- b. False

A

9. What are the four primary components of a typical e-commerce site are: [chapter 8, slide 24, moderate]

- a. The shopping and ordering system
- b. The merchant account
- c. The payment gateway
- d. The security system
- e. All of the above

E

10. Nearshoring is business done with partners... [chapter 9, page 267, easy]

- a. In the same country.
- b. A far distance outside the country.
- c. Outside the country, but in the same geographic region.
- d. No partners are used.

C

11. What does Ron Swift's company, TeraData, specialize in? [guest speaker, Ron Swift, presentation, easy]

- a. Data Warehousing
- b. Business Process Management
- c. Marketing Processes
- d. Data Modeling
- e. Relational Databases

A

12. Mytypeface.com is used to: [bonus application presentation, mytypeface.com, easy]

- a. Make personalized flashcards

- b. Create a personalized font
- c. Find your favorite music artists
- d. Look at and organize your pictures

B

1. The largest number of memory chips in your computer is in the form of ROM.

[Chapter 2, pg. 30, Easy]

- a) True
- b) False

FALSE

2. Knowledge work Activities include all of the following EXCEPT: [Chapter 3, pg. 57, Figure 3.1, Moderate]

- a) Discovery
- b) Transformation
- c) Analysis
- d) Integration

D) INTEGRATION

3. Which of the following networks covers a very small space that ranges from the size of a human body to a small office? [Chapter 5, pg. 121, Moderate]

- a) PAN
- b) WAN
- c) MAN
- d) Internet

A) PAN

4. Which of the following categories of computer hierarchy represents the type of computer with the LEAST processing power at any given time? [Chapter 5, pg. 120, Table 5.1, Easy]

- a) Server Farms
- b) Supercomputer
- c) Personal Digital Assistant
- d) Server Farm

C) PDA

5. A _____ study determines whether a project is technically and economically possible? [Chapter 6, pg. 157, Easy]

- a) Practicality
- b) Feasibility
- c) Possibility
- d) Developmental

B) FEASIBILITY

The basic premise of Moore's law is

the density of transistors on a computer chip doubles roughly every 20 months

social networking sites generate revenue through
advertising

what is an information system

a group of components that interact to produce information

which of the following is an example of an output device?

- a. A mouse
 - b. A set of headphones
 - c. A scanner
 - d. A computer keyboard
 - e. A microphone
- a set of headphones

which of the following is not a function of the central processing unit?

- a. Stores results in memory
 - b. Performs arithmetic and logical comparisons
 - c. Stores data
 - d. Performs calculations
 - e. Selects instructions
- stores data

As predicted by Moore's law, the capacity of storage devices is _____ as the costs

_____ increasing, decreasing

bytes consist of _____ bits of memory

8

Instructions move from main memory into the CPU via the

- a. network card.
- b. memory chip.
- c. operating system.
- d. data channel.
- e. cache.

data channel

which of the following is an example of an operating system?

- a. Glass Fish
- b. Java
- c. Unix
- d. Boot Camp
- e. VMware Fusion

Unix

volatile memory means that

the contents are lost once power is off

software applications that provides capabilities common across all organizations and industries are called

horizontal market applications

porter originally developed the five forces model to determine _____

potential profitability of an industry

which of the following is an example of a competitive strategy employed by a firm

- A) increasing the price of its product when raw material prices increase
- B) launching a unique product targeted at a section of consumers
- C) advertising its products nationwide like its competitor organizations
- D) laying off staff in order to cut down costs during a recession period

launching a unique product targeted at a section of consumers
which of the following is a process implementation principle of competitive advantage
establishing alliances

manufacturing systems that use linkages also use _____ to plan production
sales forecasts

_____ includes general management, finance, accounting, legal and
government affairs

firm infrastructure

each stage of the value chain not only adds value to the product but also _____
accumulates costs

_____ are commonplace, routine, everyday business processes

operational processes

which of the following is true about strategic processes?

They have broad scope and affect most of the firm.

what are the three terms represented in the philosophy of SOA?

Service; Encapsulation; Standards

_____ refers to a condition that exists when data are isolated in separated or when
data are duplicated in various places

information silos

An ERP module is a(n) _____

distinct and logical grouping of processes

Which of the following challenges of implementing an ERP system is people-related?

A) the approval of customer credit

B) the failure to specify objectives for new processes

C) the structure of the bill of material

D) the order size

the failure to specify objectives for new processes

the customization of ERP software to meet different customer requirements without
changing program code is called _____

configuration

a software consulting firm sends a formal document to its supplier, requesting for the
delivery of 50 desktop computers. This is an example of a(n) _____

purchase order

students and classes have a _____ relationship

many-to-many

which of the following represents a data hierarchy from largest to smallest

database, file, record, field

which of the following types of software controls the primary functions of a computer
system?

operating system

the _____ you type into your browser can also be called a web address

URL

The internet uses:

TCP/IP suite of packet switching protocols

and

A number of routers connecting points throughout a worldwide backbone

in the internet networks messages are divided into smaller units called _____ each of which contains a specific number of bits
packets

A(n) _____ is a device with the sole purpose of accepting packets and determining the best way to send them to the destination computer
router

A _____ is placed in a computer to provide the physical connection between the computer and a local network
network interface card

social media _____ are the companies that operate the SM sites
application providers

which of the following is true about Web 2.0 applications?
they are subject to frequent interface changes

which of the following is true of social networking problems?

Responses are best reserved for when the problematic content has caused the organization to do something positive as a result.

which of the following is true of systems analysts?

they integrate the work of programmers, testers and users

which of the following is true of systems development?

it requires coordinated teamwork of both specialists and nonspecialists with business knowledge

which of the following is a disadvantage of building information systems before business processes'?

some aspects of business processes are unlikely to be considered when the system is constructed first

information systems ethics is about

people involved in the system

the ongoing process which involves fitting IT architecture to business objective is called alignment

In an ideal world, the information systems that a company uses would support the _____ of the company
strategy

The Canadian legislation that is similar to the Sarbanes-Oxley Act in the US is the Budget Measures Act

Under Bill 198 both management and the _____ face criminal liability if internal controls are defective
external auditor

which of the following is the most important indicator of alignment?

communication between IT and business executives

Most jobs in the ICT industry require a mix of _____ and technical skills.
interpersonal

the _____ certification is recognized globally and has been earned by more than 90000 professionals. Members have job titles like is auditor, consultant, IS security professional, regulator, chief information officer and internal auditor.

certified information systems auditor CISA

COBIT stands for

Control objectives for Information and Related Technology

The IT structure is like a

city plan

Alignment is not only about planning and building frameworks, but also about effectiveness in communication

What is the role of the ISACA

developing knowledge and standards relation to IT audits and IS governance

Moving downward in the Zachman framework provides a higher levels of detail

though it may seem obvious, one of the hardest things to do when planning how your organization will use information systems is to

align IS with organizational strategy

which of the following is true regarding an incident-response plan?

the plan should identify critical personnel and their off-hours contact information

which of the following is a valid difference between a password and user name?

A username identifies the user whereas a password authenticates the user

which of the following is true about biometric authentication?

it uses personal characteristics for authentication

Which of the following is NOT an element of computer security?

A) System owners should not have computer security responsibilities outside their own organizations.

B) Computer security responsibilities and accountability should be made explicit.

C) Computer security should be periodically reassessed.

D) Computer security is constrained by societal factors.

System owners should not have computer security responsibilities outside their own organizations.

A group of intruders accessed RK bank's IP address and accepted payments on the banks behalf. This attack is an example of _____

spoofing

A malicious hacker flooded an online retailer's server with millions of bogus service requests. Due to this, the Web site's server was overloaded and the site was unable to service legitimate customer requests. This attack is an example of which of the following security threats?

Denial of Service

which of the following is a support activity in the value chain?

negotiating prices with vendors

CPU speed is expressed in cycles called _____

Hertz

Which of the following statements is true about processes and procedures of an information system?

A. Each information system has a different procedure for every process it supports.

B. Procedures do not change with the changes made to an information system.

C. Changes to an information system will not affect the processes that use it.

D. A process will have the same procedure for every information system.

Each information system has a different procedure for every process it supports.

The difference between the value that an activity generates and the cost of the activity is called the _____.

margin

What changes must a company make if its value chain's margin is negative?

The value must be increased so that it exceeds the cost.

Which of the following is a critical data characteristic?

random

high cost

just sufficient

arrival after task completion

just sufficient

_____ is the ability to make and manipulate models

abstract reasoning

An address on the internet is called a(n)

URL

which of the following is true about objectives of processes?

An efficiency objective aims to conserve resources.

A company's information system discovers a customer's poor credit history only after certain goods have been shipped to him. The information produced, as a result, was not useful because the data was _____

ill-timed

As a candidate at a job interview for the position of video and graphic designer, Steve is asked to create a design using Corel VideoStudio X3, a relatively new software that he has not learned yet. Which of the following skills is the interviewer trying to test?

ability to experiment

which of the following is true about thin-client applications?

they run inside browsers

which of the following is an example of a strategic Human Resources processes?

deciding the organizational structure

A _____ understands the technical aspects of enterprise resource planning (ERP) and helps plan, configure, and implement an ERP system for company use.

systems analyst

Decisions in the BPMN model are represented by _____.

diamonds

When organizations upgrade existing enterprise resource planning systems, they can be challenged by the version lock problem because of _____.

heavy customization

which of the following is a feature of a structured process?

It is a formally defined process.

According to Porter, _____ includes recruiting, compensation, evaluation, and training of full- and part-time employees.

human resources

According to Porter's model of business activities, _____ are interactions across value activities.

linkages

Which of the following is a support activity in the value chain?

setting up contractual arrangements for procurement

The procedures for structured processes are _____

prescriptive

_____ is SAP's high-level application language that is used to enhance the functionality of an SAP implementation.

ABAP

Ellen is the marketing manager of Qtopia Inc. She often develops ideas and plans with the help of her colleagues, and provides and receives critical feedback. According to Reich's four critical skills, Ellen is displaying _____ skills.

collaboration

Which of the following is an example of managerial sales and marketing process?

evaluating promotional discounts

computers represent data using _____

binary digits

_____ means creating more output with the same inputs or the same output with fewer inputs.

efficiency

Which of the following is a difference between native and thin-client applications?

...

A storage disk is an example of the _____ component of an information system.

hardware

When international firms consolidate all their operations within a large enterprise resource planning implementation, it is referred to as a(n) _____.

single instance

the purpose of (a) _____ is to extract and clean data from operational systems and other sources.

data warehouse

Advertisers can actually purchase search words from Google by using

adwords

Radio-frequency identification technology is used in supply chains to _____.

recognize and track items

In today's business world content is just not about collection and distribution. It is also about

presenting the content appropriately for the audience

which of the following is an objective of the returns management process?

efficiently getting the defective products to the right supplier in the supply chain

Your local burger joint wants to reap the benefits of improved decision making by using its sales data.

In order to do this, it must

incorporate data mining products as part of its complete information systems

Which of the following is most likely the final activity of the procurement process after the implementation of SAP?

posting an outgoing payment

_____ is the application of statistical techniques to find patterns and relationships in data and to predict outcomes.

data mining

If a web sites value increases with the number of users and the amount of use, this is a Web 2.0 characteristic called

the network effect

You build the links between tables using the _____ window.

relationships

The ongoing process which involves fitting IT architecture to business objective is called alignment

The time required to perform a task expands to the time available to do it" is parkinson's law

Application Service Providers _____ software applications to other companies.
rent

Which of the following is the main activity of the maintenance phase of the SDLC?
fixing problems or adapting to changes

If the proposed information system violated antitrust laws, this should be discovered in the _____ study of the system definition phase.

organizational feasibility

A company establishes data rights and responsibilities and educates employees on how to backup and recover the database, but the company still needs to address the _____ safeguards.

technical

Though it may seem obvious, one of the hardest things to do when planning how your organization will use information systems is to

align IS with organizational strategy

ISACA has become a leader in

IT audits and IT governance

The existence of _____ user accounts is a serious security threat.

unused

PMBOK first published in 1996 is now in its _____ edition.

fourth

Dynamic processes are evaluated on effectiveness more than efficiency because _____.

they change so fast that it is often not possible to measure efficiency over time

Which of the following trends driven by the Moore's Law is changing the way businesses use IT?

the rapid growth of Internet accessibility

A _____ understands the technical aspects of enterprise resource planning (ERP) and helps plan, configure, and implement an ERP system for company use.

systems analyst

_____ is the ability to model the components of a system and to connect the inputs and outputs among those components into a sensible whole, one that explains the phenomenon observed.

systems thinking

A megabyte is equal to

1024 KB

An enterprise application integration system describes the locations of an organization's data by _____.

keeping files of metadata

_____ determines the structure, features, and functions of every information system.
competitive strategy

Which of the following statements is true about scaling of applications?

Based on the device on which it is running, IE 10 chooses the size and version of graphics.

Which of the following companies has the largest market share in the enterprise resource planning industry?

SAP

Procedures for dynamic processes are _____.
supportive

Which of the following is a reason for organizations to store data in separate databases?

Each department in an organization may have different objectives.

Which of the following is true about operational processes?

They have more computerized actors than other types of processes.

The protocol standard IEEE 802.3 used in wired LAN connections is also called _____.
ethernet

Which of the following is an industry barrier for new entrants in an established market?
government policies

Which of the following results is attributed to Moore's Law?

The ratio of price to performance of computers has fallen drastically.

_____ concern resource use and include planning, assessing, and analyzing the resources used by the company in pursuit of its objectives.

Managerial processes

The procedures for structured processes are _____.
prescriptive

Which of the following statements is true about desktop virtualization?

it allows a user to access the virtualized desktop from any computer

_____ are programs that run on a server-tier computer and that manage HTTP traffic by sending and receiving Web pages to and from clients.

Web servers

Enterprise resource planning vendors outside of Tier 1 are establishing a strong niche in the industry by focusing on _____.
industry-specific systems

An organization shares _____ with its suppliers using SAP.
purchase orders

A data warehouse contains a special database that stores the _____, which records its source, history, and format of the data.
metadata

Which of the following is a synonym for data-mining?

knowledge discovery in databases

It is better to have data that is too fine than too coarse because fine data can be converted to coarse data by

summing and combining the data

Which of the following is a potential solution to the bullwhip effect?

Sharing sales order data in real-time

Billy Beane is generally credited with introducing

scientific and statistical techniques that capture more data for major league baseball.

Columns are also called
fields

Disintermediation occurs when

a manufacturer sells directly to the end user.

modern content management systems

seek out documents located across an organization and actively manage access to the content.

What does CMS stand for?

Content Management System

Systems that focus on making data collected in OLTP useful for allowing multiple decision makers to collaborate are often referred to as

decision support systems DSS

The value of a social capital varies depending on a network's number of relationships, the strength of those relationships and the resources controlled.

_____ systems integrate data from a variety of sources, process that data, and produce and deliver formatted reports to users.

Reporting

Compared to traditional processing, Web 2.0 processing is characterized by viral marketing, software as a free service, mashups encouraged.

A database consists of relationships, rows tables

Which of the following is a file extension name of a video file?

.mpg

_____ consists of forms, formatted reports, queries, and application programs.

a database application

Merchant companies usually consist of

B2B, B2G and B2C types of ecommerce.

Which of the following is an assumption about information systems that Ackoff disputed?

managers have no problem making decisions if they get the data they need

_____ is the application of statistical techniques to find patterns and relationships in data and to predict outcomes.

data mining

The _____ effect occurs when companies order more supplies than are needed due to a sudden change in demand.

bullwhip

When creating a new table in Access, the primary key is set by clicking on the _____ icon.

key

Clickstream data is often _____ and much of it has to be discarded.

too fine

Data that resides in different sources or is incompatible with the intended purpose is an example of

non-integrated data

On some websites, users can give each other customer support or even participate in the creation of solutions, designs and products. This phenomenon is called

crowdsourcing

eBay.ca would be an example of

B2C nonmerchant ecommerce

Electronic exchanges are web sites that

match buyers and sellers

If transactions are entered and processed immediately upon entry, then the system is operating in

real time

Which of the following statements is true about the impact of SAP on organizations?
People require new sets of skills after implementing SAP.

Economic factors to be considered by vendors who want to engage in ecommerce include

show rooming and higher customer service expenses

_____ integrate data from multiple sources, and process those data by sorting, grouping, summing, averaging, and comparing.

reporting systems

The term Web 2.0 was first popularized by

Tim O'Reilly

It is possible to create a primary key composed of _____ columns or fields.

multiple

The resources of a procurement process are referred to as _____.

Inventories

It is almost certain that in reality, when you take on a data-mining project, the data will be

dirty

Highly summarized data is known as being

coarse

_____ measure(s) the impact of a set of variables on another variable.

regression analysis

The properties of each field are set at the _____ of the table design window.

bottom

Which of the following is an assumption about information systems that Ackoff disputed?

managers are aware of the data they need

In MS Access, _____ is a term that refers to the attributes that are described in the data model.

field

Which of the following is a file extension name of a graphics file?

.bmp

When it comes to social networks, if a company hires sales people, has a strong customer support system, and engages in public relations, the company is building social capital

A company should clearly define the security _____ for each position.

responsibilities

One reason that governance is important is

to ensure that an organization produces good results while working to avoid bad results

The _____ approach is the classic process used to develop information systems.

systems development life cycle (SDLC)

In order to prioritize their activities and protect an organization from possible risk and loss, security personnel must document the position _____ of all employees.

sensitivity

The last stage of testing is the _____ test, where future system users try out the new system.

beta

Be sure and purchase your antispyware program from a(n) _____ vendor, because some free programs in the past were actually malware programs in disguise.

reputable

The ongoing process which involves fitting IT architecture to business objective is called alignment

Part of Green IT means using IT to support (the)

triple bottom line

_____ is one of the fastest-growing crimes in Canada because it is relatively easy to do.

identity theft

Computing infrastructure should be located in _____ buildings designed to house expensive and critical equipment.

fire-resistant

What is information technology architecture?

A basic framework for all the computers, systems, and information management that support organizational services

When an employee notices a virus on his machine, the _____ plan should specify what to do.

incident response

_____ is the fourth phase of the SDLC.

implementation

The set of approved user requirements is the main input into the _____ phase of the SDLC approach.

component design

Companies involved in the _____ industry face government regulatory restrictions.

e-waste

The function of COBIT is to

help organizations get the best from their IT investments

Which of the following is the most important indicator of alignment?

communication between IT and business executives

The process groups in PMBOK can be related to the _____ project management areas.

9

The main problem of the SDLC approach to systems development is the _____ nature of the process. This refers to the fact that each phase is meant to be completed and not repeated as the project moves on to the next phase.

waterfall

Passwords have weaknesses because users often choose simple passwords, which _____ systems can easily guess.

intrusion

In Canada, _____ has an agreement with ISACA to recognize a designated specialist in information systems auditing.

CICA

To determine if the proposed information system is justified economically, organizations must assess the

cost feasibility

Which of the following is the main activity of the maintenance phase of the SDLC?

Fixing problems or adapting to changes

In developing architecture a(n) _____ must consider things like organizational objectives, information flows, databases and supporting technology.

enterprise architect

When an incident is reported, _____ is (are) of the essence.

speed

Adware is _____ than spyware.

more benign

Senior management often justifies reducing the time schedules for system projects by saying that the tighter schedules make workers work more efficiently.

_____ to (for) the physical computers that run the DBMS and all devices that store database data should be carefully controlled.

access

Sarbanes-Oxley and Bill 198 apply to

publicly traded companies

Wallace and Keil identified _____ risks inherent in IT projects.

52

PMBOK first published in 1996 is now in its _____ edition.

fourth

According to Reich and Benbasat (1996), effective alignment occurred in organizations that developed a climate of supporting

the sharing of domain knowledge and common business practices.

Precise estimate costs for IT projects are difficult to develop because technology is continually changing.

Users often resist biometric identification because they feel it is

invasive

Information systems ethics is about

people involved in the system

The purpose of a(n) _____ is to protect databases and other organizational data.

data safeguard

PIPEDA stands for

Personal Information Protection and Electronic Documents Act.

The _____ certification is recognized globally and has been earned by more than 90 000 professionals. Members have job titles like is auditor, consultant, IS security professional, regulator, chief information officer, and internal auditor.

CISA`

In terms of ethics, advances in information technology bring about new _____ for an organization.

choices

To determine if the proposed information system is justified economically, organizations must assess the

cost feasibility

EPEAT is a tool based on _____ criteria that measure a product's efficiency and sustainability attributes.

28

Information Technology Project Management skills are central to the skills needed by organizations to _____ (to) an increasingly complex business environment.

adapt

The focus of an _____ is placed on the information resources that are used to collect, store, process, and retrieve information.

information systems audit

Database systems minimize the following problems:

- Data isolation:
- Data inconsistency: Various copies of the data do not agree.

data

should be of high quality, meaning that they should be accurate, complete, timely, consistent, accessible, relevant, and concise.

internal sources

corporate databases and company documents

Managing data in organizations is difficult because

-the amount of data increases exponentially with time

-data are also scattered throughout organizations, and they are collected by many individuals using various methods and devices

-data are generated from multiple sources: internal sources, personal sources, external sources

-new sources of data are constantly being developed and data degrade over time.

-Data rot

-organizations have developed info systems for specific business processes that support these processes impose unique requirements on data, which results in repetition and conflicts across the organization. produce inconsistent data within enterprise preventing a company from developing a unified view of core business information

-federal government regulations

-companies are drowning in data

personal sources

personal thoughts, opinions, and experiences

external sources

commercial databases, government reports, and corporate websites

Clickstream data

data that visitors and customers produce

when they visit a website and click on hyperlinks. provide a trail of the users' activities in the website, including user behaviour and browsing patterns.

Data rot :

over time, temperature, humidity, and exposure to light can cause physical problems with storage media and make it difficult to access the data. finding the machines needed to access the data can be difficult

Data governance

approach to managing information across an entire

organization involving a formal set of business processes and policies that are designed to

ensure that data are handled in a certain way

Business objective

make info available, transparent, and useful for the people who are authorized to access it, from the time it enters an organization till its outdated and deleted.

One strategy for implementing data governance is

master data management

Master data management

process that spans all organizational business processes and applications.

Master data

set of core data, such as customer, product, employee, vendor, geographic location... that span the enterprise information systems, data applied to multiple transactions and are used to categorize, aggregate, and evaluate the transaction data.

Transaction data

data generated and captured by operational systems, describe the business's activities or transactions

file management environment

evolved because organizations typically automated their functions one application at a time.

each application has a specific data file related to it that contains all of the data records the application requires

Database systems minimize the following problems:

-Data redundancy

-Data isolation

-Data inconsistency

Data redundancy

The same data are stored in multiple locations.

Data isolation

Applications cannot access data associated with other applications

Data inconsistency:

Various copies of the data do not agree.

database systems maximize the following:

Data security:

Data integrity:

Data independence:

Data security:

Because data are "put in one place" in databases, there is a risk of losing a lot of data at one time. So databases must have extremely high security measures to minimize mistakes and deter attacks.

Data integrity:

Data meet certain constraints;ex, theres no alphabetic characters in a Social Insurance Number field.

Data independence:

Applications and data are independent of one another; that is, applications and data are not linked to each other, so all applications are able to access the same data.

True or false:

Data are organized in a hierarchy that begins with bits and proceeds all the way to databases

True

A byte

a single character can be a letter, a number, or a symbol

a field



A logical grouping of characters into a word, a small group of words, or an identification number

a record

A logical grouping of related fields, such as the student's name, courses taken, date, and grade

data file or a table

a logical grouping of related records

database

a logical grouping of related files

database management system (DBMS)

a set of programs that provide users with tools to create and manage a database

organization can access the data by

using query and reporting tools that are part of the DBMS or by using application programs specifically written to perform this function

Popular examples of relational databases are

Microsoft Access and Oracle.

relational database model is based on the concept of

two-dimensional tables Each of these tables

contains records (listed in rows) and attributes (listed in columns).

data model

key to designing effective database. diagram that represents entities in database and their relationships

instance of an entity

is each row in a relational table, that's a specific, unique representation of the entity

Big Data

collection of data so large and complex that it's difficult to manage using traditional database management systems, Big Data is about predictions

Big Data generally consists of the following:

- Traditional enterprise data:
- Machine-generated/sensor data:
- Social data:
- Images captured
- Traditional enterprise data:

Examples are customer information from customer relationship management systems, transactional enterprise resource planning data, web store transactions, operations data, and general ledger data.

- Machine-generated/sensor data:

Examples are smart meters; manufacturing sensors; sensors integrated into smart phones, automobiles, airplane engines, and industrial machines; equipment logs; and trading systems data.

Social data:

Examples are customer feedback comments; microblogging sites such as Twitter; and social media sites such as Facebook, YouTube, and LinkedIn.

- Images captured

by billions of devices located throughout the world, from digital cameras and camera phones to medical scanners and security cameras.

Big Data has three distinct characteristics that distinguish it from traditional data.

volume, velocity, and variety.

Velocity:

Velocity is critical because it increases the speed of the feedback loop between a company, its customers, its suppliers, and its business partners.

Variety:

In contrast to traditional data, Big Data formats change rapidly. They include satellite imagery, broadcast audio streams, digital music files, web page content, scans of government documents, and comments posted on social networks.

Issues with Big Data

- Big Data can come from untrusted sources.

- Big Data is dirty: Dirty data refers to inaccurate, incomplete, incorrect, duplicate, or erroneous data.

- Big Data change especially in data streams: Organizations must be aware that data quality in an analysis can change, or the data itself can change, because the conditions under which the data are captured can change.

first step for many organizations toward managing data was to integrate info silos into a database environment and then to develop data warehouses for decision making.

Second step, toward managing data

many organizations turned their attention to the business of information management—making sense of their proliferating data.

In addition to existing data-management systems, today many organizations employ NoSQL databases to process Big Data.

Why are NoSQL databases useful when working with Big Data.

NoSQL databases can manipulate structured as well as unstructured data and inconsistent or missing data.

Putting Big Data to Use

- Making Big Data available for relevant stakeholders can help organizations gain value

- Big Data allows organizations to improve performance by conducting controlled experiments.

- Segmenting company's customers means dividing them into groups that share one or more characteristics.

- Companies use it to create new business models.

- organizations can use it to process all the data relating to a particular phenomenon, they don't have to rely as much on sampling.

Big Data Used in the Functional Areas of the Organization

- Human Resources: Employee benefits, health care, represent a major business expense. some companies use Big Data to better manage these benefits.

- Product Development: can capture customer preferences and put that info to work in designing new products.

- Operations: companies use information technology to make their operations more efficient

- Marketing: used data to better understand their customers and target their marketing efforts more directly, enables marketers to craft more personalized messages.

- Government Operations

data warehouse

repository of historical data that are organized by subject to support decision makers in the organization. More expensive used by large companies

data mart

is a low-cost, scaled-down version of a data warehouse that is designed for the end-user needs in a strategic business unit (SBU) or an individual department. implemented more quickly than data warehouses, in less than 90 days

The basic characteristics of data warehouses and data marts include the following

- Organized by business dimension or subject
- Use online analytical processing (OLAP)
- Integrated
- Time variant: maintain historical data
- Nonvolatile: users can't change or update the data
- Multidimensional

environment for data warehouses and marts includes the following:

- Source systems provide data to warehouse or mart.
- Data-integration technology and processes that prepare the data for use.
- Different architectures for storing data in an organization's data warehouse or data marts.
 - Different tools and applications for the variety of users.
 - Metadata, data quality, governance processes that ensure that the warehouse or mart meets its purposes.

a variety of source systems:

operational/transactional systems, enterprise resource planning (ERP) systems, website data, third-party data

(e.g., customer demographic data), and more

ETL process or data integration

organizations need to Extract the data, Transform them, and Load them into a data mart or warehouse.

"load window."

specific period where data are loaded into warehouse or mart. This window is becoming smaller as companies seek to store ever-fresher data in their warehouses

what do companies do as a result of the small load window

many companies have moved to real-time data warehousing where data are moved from source systems to the data warehouse or mart almost instantly

one central enterprise data warehouse

data stored in the warehouse are accessed by all users and represent the single version of the truth.

independent data marts

architecture stores data for a single application or a few applications, such as marketing and finance

why are independent data mart architecture is not particularly effective

- doesn't reflect an enterprise-wide approach to data management
- expensive to build and maintain
- contain inconsistent data
- different source systems

hub and spoke

architecture contains a central data warehouse that stores the data plus multiple dependent data marts that source their data from the central repository
metadata

maintain data about the data

Companies that are effective in BI governance create a senior-level committee composed of vice presidents and directors who

(1) ensure that business & BI strategies are aligned

(2) prioritize projects

(3) allocate resources.

a middle management-level committee

oversees various projects in the BI portfolio to ensure that these projects are being completed according to

the company's objectives.

lower-level operational committees

perform tasks such as creating data definitions and identifying and solving data problems

users are information producers (IT developers and analysts)

primary role is to create information for other users

users are information consumers (managers and executives)

they use information created by others.

End users

access needed data quickly and easily via web browsers because these data are located in one place.

conduct extensive analysis with data in ways that were not previously possible.

obtain a consolidated view of organizational data.

data warehouses limitations.

very expensive to build and to maintain.

incorporating data from obsolete mainframe

systems can be difficult and expensive.

people in one department might be reluctant to

share data with other departments.

Explicit knowledge

deals with objective, rational, and technical knowledge

knowledge that has been codified (documented) in a form that can be distributed to others or transformed into a process or a strategy

tacit knowledge

cumulative store of subjective or experiential learning. imprecise and costly to transfer, highly personal. unstructured making it difficult to formalize or codify

goal of knowledge management

help an organization make the most productive use

of the knowledge it has accumulated

Knowledge management systems (KMSs)

use modern information technologies (Internet, intranets, extranets, databases) to systematize, enhance, expedite intrafirm & interfirm knowledge management

Benefits of best practices

trains new account managers.

improved customer service, more efficient product development, improved employee morale, retention.

Challenges of best practices

employees must be willing to share their personal tacit knowledge
continually maintain and upgrade its knowledge base willing to invest in resources
needed to carry out these operations.

Why is the knowledge in an effective KMS is never finalized
environment changes over time and knowledge must be updated to reflect these
changes.

functioning KMS cycle

1. Create knowledge
2. Capture knowledge
3. Refine knowledge
4. Store knowledge
5. Manage knowledge
6. Disseminate knowledge

Create knowledge:

Knowledge is created as people determine new ways of doing things or develop know-how. Sometimes external knowledge is brought in.

Capture knowledge

: New knowledge must be identified as
valuable and be represented in a reasonable way.

Refine knowledge:

New knowledge must be placed in context
so that it is actionable. tacit qualities (human insights) must be captured along with
explicit facts.

Store knowledge:

Useful knowledge must then be stored in a
reasonable format in a knowledge repository so that other people in the organization
can access it.

Manage knowledge:

knowledge must be kept current. It must be reviewed regularly to verify that it is relevant
and accurate.

Disseminate knowledge:

must be available in useful format to anyone in organization who needs it, anywhere,
anytime.

Structured query language (SQL)

allows people to perform complicated searches by using relatively simple statements or
key words.

Typical key words in SQL are

SELECT (to choose a desired attribute),

FROM (to specify the table or tables to be used), WHERE (to specify conditions to apply
in the query).

query by example (QBE).

user fills out a grid or template (known as a form) to construct a sample or a description
of the data desired.

degree of a relationship

indicates number of entities associated with a relationship

connectivity

describes the relationship classification.

Cardinality

maximum number of times an instance of one entity can be associated with an instance in the related entity

Normalization

method for analyzing, reducing a relational database to streamlined form to ensure minimum redundancy, max data integrity, optimal processing performance.

Functional dependencies

value of one particular attribute is associated with a specific single value of another attribute.

Business analytics (BA)

process of developing actionable decisions or recommendations for actions based on insights generated from historical data

Business intelligence (BI)

broad category of applications, technologies, processes for gathering, storing, accessing, analyzing data to help business users make better decisions.

what ratio is an indication of the organization's productivity.

managers output and input for which he's responsible for

managers three basic roles

1. Interpersonal roles: Figurehead, leader, liaison

2. Informational roles: Monitor, disseminator, spokesperson, analyzer

3. Decisional roles: Entrepreneur, disturbance handler, resource allocator, negotiator

decision making as composed of three major phases:

intelligence, design, and choice.

intelligence phase

managers examine a situation and then identify and define the problem or opportunity

design phase

construct a model for addressing the situation by making assumptions that simplify reality and by expressing the relationships among all of the relevant variables.

Managers then validate the model by using test data. decision makers set criteria for evaluating all of the potential solutions that are proposed

choice phase

involves selecting a solution or course of action that seems best suited to resolve the problem.

decision making is difficult due to the following trends

number of alternatives is constantly increasing

time pressure

conduct a sophisticated analysis

bringing everything together quickly and inexpensively represents a serious challenge.

types of decisions can be placed along two major dimensions:

problem structure and the nature of the decision

problem structure

decision-making processes fall along a continuum ranging from highly structured to highly unstructured

Structured decisions

deal with routine and repetitive problems for

which standard solutions exist, like inventory control.

unstructured decision

no standardized procedure for carrying out any of the three phases

Semistructured decisions

combination of standard solution procedures and individual judgment

All managerial nature decisions fall into one of 3 categories:

1. Operational control: Executing specific tasks efficiently and effectively
2. Management control: Acquiring and using resources efficiently in accomplishing organizational goals
3. Strategic planning: The long-range goals and policies for growth and resource allocation

BA process begins with

a business problem, known as pain points

with data you're able to combine and analyze structured and unstructured data from many sources in the form of Big Data. organizations integrate and "clean" these data into data marts and data warehouses through (ETL). The data in the data warehouse are now

available to be analyzed by a variety of analytics tools and techniques.

Organizations can apply analytics tools and techniques to data in the form of three possible analytics models:

descriptive analytics, predictive analytics, and prescriptive analytics.

The Development of One or a Few Related Analytics Applications (analytic target 1)
point solution for a departmental need, such as campaign management in marketing.

The Development of Infrastructure to Support Enterprisewide Analytics. (analytic target 2)

supports both current & future analytics needs. crucial component at this level is an enterprise data warehouse

Support for Organizational Transformation. (analytic target 3)

uses business analytics to fundamentally transform the ways it competes in the marketplace

BA tools for analyzing data

Excel, multidimensional analysis (also called OLAP), data mining, and decision-support systems.

Data mining

process of searching for valuable business information in a large database, data warehouse, or data mart.

two basic operations: (1) predicting trends & behaviors (2) identifying previously unknown patterns.

Retailing and sales data mining

Predicting sales, preventing theft & fraud, determining correct inventory levels, distribution schedules among outlets

Banking data mining

Forecasting levels of bad loans and fraudulent credit card use, predicting credit card spending by new customers, determining kinds of customers will best respond to new loan offer

Decision support systems (DSSs)

combine models and data to analyze semistructured problems, some unstructured problems that involve extensive user involvement

three types of analysis

Sensitivity analysis: examines how sensitive an output is to change in input while keeping other inputs constant.

What-If Analysis: A model builder must make predictions and assumptions regarding input data, many are based on the assessment of uncertain futures

Goal seeking: calculate the value of inputs necessary to achieve a desired level of output.

Data reduction

conversion of raw data into a smaller amount of more useful information. Descriptive, predictive, and prescriptive analytics are steps in data reduction.

1. Descriptive analytics

summarize what has happened in the past and allow decision makers to learn from past behaviors.

2. Predictive analytics

uses a variety of analytics techniques, tools to examine recent, historical data in order to detect patterns, predict future outcomes, trends.

4. Prescriptive analytics

recommends one or more courses of action and showing the likely outcome of each decision.

Prescriptive analytics requires a predictive model with two additional components: actionable data and a feedback system that tracks the outcome produced by the action taken.

Drill down:

The ability to go to details, at several levels; it can be done by a series of menus or by clicking on a drillable portion of the screen.

Critical success factors (CSFs)

The factors most critical for the success of business. These can be organizational, industry, departmental, or for individual workers.

Key performance indicators

The specific measures of CSFs.

Status access

The latest data available on KPI or some other metric, often in real time.

Trend analysis

Short-, medium-, and long-term trend of KPIs or metrics, which are projected using forecasting methods.

Exception reporting

Reports highlight deviations larger than certain thresholds. Reports may include only deviations.

a Management Cockpit

strategic management room containing an elaborate set of dashboards that enable top-level

decision makers to pilot their businesses better.

The goal is to create an environment that

encourages more efficient management meetings and boosts team performance via effective communication.

Management Cockpit Room four walls are designated by color

Black Wall displays the principal success factors and financial indicators.

Red Wall measures market performance.

Blue Wall projects the performance of internal processes and employees.

White Wall indicates the status of strategic projects.

geographic information system (GIS)
computer-based system for capturing, integrating, manipulating, displaying data using digitized maps.
every record or digital object has an identified geographical location.
geocoding
enables users to generate information for planning, problem solving, and decision making

architecture of an enterprise system refers to
the technical structure of the software, the ways that users interact with the software, and the ways the software is physically managed on computer hardware
modern ES have either
three-tier client-server architecture or a service-oriented architecture
Client-Server Architecture applications consist of three components or layers
(1) how you interact with the application (using menus, typing, and selecting) -presentation layer
(2) what the application allows you to do (create formulas or charts, compose an essay) -application layer
(3) where the application stores your work (on your hard drive or flash drive) -data layer,
Client-Server Architecture applications
all three layers are contained in one system

three-tier client-server architecture
separates the 3 layers into three separate systems
three-tier client-server architecture reduces
costs of acquiring, implementing, and using an ES while significantly increasing the scalability of the systems
Scalability
refers to the ability of the hardware and software to support a greater number of users easily over time,
typically at a decreasing cost per user
Service-oriented architecture (SOA)
technical capabilities that allow systems to connect with one another through standardized interfaces called Web services
Web services
companies could now integrate multiple client-server applications and create enterprise mash-ups, or composite applications.
SOA enables companies to
build composite applications on top of their existing three-tier client-server applications without changing the underlying applications
Enterprise resource planning (ERP) systems
are the world's largest and most complex ES
ERP systems focus primarily on

intra-company processes (operations that are performed within an organization) and they
integrate functional and cross-functional business processes
SAP was the first company to
create a fully integrated and global ERP system, SAP®
R/3, which could manage end-to-end processes for companies that operated in many
different countries, with multiple languages and currencies
capabilities of an ERP system are often
described in
terms of modules or specific capabilities
common SAP ERP modules
Production planning (PP).
Materials management (MM)
Sales and distribution (SD)
Plant maintenance (PM)
Project systems (PS)
Quality Management (QM)
Financial Accounting (FI)
Management accounting/ controlling (CO)
Human resources (HR)
Business intelligence (BI)
ERP systems, the next step in the evolution of ES was to
connect these systems so they could support inter-company processes (processes that
take place between and among companies.
inter-company systems are
supply chain management (SCM)
and supplier relationship management (SRM)
(SRM) systems
connect a company's ERP system to those of its suppliers
SCM system
connects a company to other companies that supply the materials it needs to make its
products
customer relationship management (CRM) systems
connect a company's ERP system to those of its customers
CRM systems provide
companies with capabilities to manage marketing, sales, and customer service.
Product lifecycle management (PLM) systems
help companies administer the processes of
research, design, and product management. Help companies take new product ideas
from the virtual drawing board to the manufacturing facility.
an application suite
collection of inter-company systems and the underlying intra-company ERP system
key benefits of utilizing a complete suite of software
the data and processes are integrated among the systems in the suite.



application platforms serve as a type of "enterprise operating system" for a company's ES landscape by allowing all of the various systems to communicate with one another and with systems outside the company

SAP NetWeaver

is the "operating system" for a company's entire range of business processes.

Data in an ERP system are used to represent the physical system in which process steps like creating a purchase order, receiving goods are carried out

three types of data in an ERP system

organizational data, master data, and transaction data.

Organizational data

are used to represent the structure of an enterprise.

three organizational data elements

client, company code, and plant

client

is the highest organizational level in SAP ERP

Each company within the enterprise is represented by a company code. Each company code represents

a separate legal entity, and it is the central organizational element in financial accounting.

True or false

A client can have multiple company

codes, but a company code must belong to only one client.

True

plant

an organizational element that performs multiple functions and is relevant to several processes.

the functions a plant performs

- Products and services are created.
- Materials are stored and used for distribution.
- Production planning is carried out.
- Service or maintenance is performed.

plant can be

a factory, a warehouse, a regional distribution center, a service center, or an office

True or false

company code can contain multiple plants but a plant can belong to only one company code

True

Master data represent

entities associated with various processes like buying materials from vendors and selling materials to customers
material master data
are some of the most complex and extensively utilized data in an ERP system

What does the material master do to manage these data
groups them into different categories or views, each of which is relevant to one or more processes
procurement process requires data concerning who is responsible for purchasing the material and how much should be ordered.

fulfillment process utilizes data

concerning product availability and shipping conditions.

Materials are categorized into different material types based on the way they are used in the firm's operations

four most common material types

are raw materials, semifinished goods, finished goods, and trading goods

Raw materials (ROH)

are purchased from an external source and used in the production process. The material master will contain data related to procurement and production but not fulfillment.

Semifinished goods (HALB)

produced in-house from other materials and are used in the production of a finished good.

Finished goods (FERT)

created by the production process from other materials, such as raw materials and semifinished goods. material master for finished goods will include data related to production and fulfillment, but not procurement

Trading goods (HAWA)

like raw materials, are purchased from a vendor however, trading goods are resold to customers. material master for trading goods will include data related to purchasing and selling but not production

material group

includes materials with similar characteristics

final factor that determines the type of data included in the material master is organizational level

the same material can be used in multiple plants, but the ways it is used can vary from one plant to another

Transaction data

reflect the consequences of executing process steps, or transaction. Examples of transaction

data are dates, quantities, prices, and payment and delivery terms

transaction documents

Documents that are created or utilized as the process is being executed examples are purchase orders, packing lists, and invoices

Documents that record data generated after the process steps have been completed include

financial accounting [FI] documents,
management accounting or controlling [CO] documents,
material documents.

what documents record the financial impact of process steps

FI and CO documents

Documents typically consist of two sections

a header section and a detail or line item section.

the line items.

The materials included in the purchase order. the data such as quantity and price, are specific to each item

header includes

data like purchase order number, date, and

payment terms that are relevant to all line items, these data are relevant to the entire document

True or false

after data are no longer needed for process execution, they then become historical data and must be archived securely and made available for many types of data analysis

True

data warehouses.

complex data repositories that store historical data

Reporting

describes the ways that users can view and analyze both transaction and historical data to help them make decisions and complete their tasks

SAP ERP provides two reporting options

simple lists of data and documents and analytics

transactional environment of SAP

ERP is an online transaction processing (OLTP) system

designed to capture and store detailed transaction data. The primary function is to execute process steps quickly and efficiently

SAP ERP includes an online analytic

processing (OLAP)

these systems use information structures to provide analytic capabilities

Information structures

capture and store specified transaction data in an aggregated and summarized form that enables

users to analyze the data as needed.

OLAP

environment is defined in terms of three features

characteristics, key figures, and period definition

Characteristics

are the objects for which data are collected

Key figures

are performance measures, such as quantities and counts that are associated with the characteristics

Work lists

identify tasks that are scheduled to be completed in a process

Online lists

Display lists of master data - such as materials, vendors, and purchasing info records - and documents - such as transaction documents, FI, CO, and material documents - that are generated during the execution of a process

Selection parameters

determine which documents will be included in the list

scope-of-list parameters

define which data will be included for the selected documents

Procurement comprises five steps that are completed in three different functional areas of the firm: warehouse, purchasing, and accounting.

warehouse, purchasing, and accounting.

A business process

an ongoing collection of related activities that create a product or a service of value to the organization

Inputs

Materials, services, and information that flow through and are transformed as a result of process activities

Resources

People and equipment that perform process activities

Outputs

The product or a service created by the process

internal customer

manager who is the recipient of an internal reporting process

external customer

an individual or a business that purchases the organization's products

Efficiency

focuses on doing things well in the process

Effectiveness

focuses on doing the things that matter; that is, creating outputs

of value to the process customer

cross-functional business processes

no single functional area is responsible for their execution.

procurement process

includes all of the tasks involved in acquiring needed materials externally from a vendor

. Procurement comprises five steps that are completed in three

different functional areas of the firm

warehouse, purchasing, and accounting.

Step one of procurement

the warehouse recognizes the need to procure materials, due to low inventory levels. The warehouse documents this need with a purchase requisition, which it sends to the purchasing department

Step two of procurement

purchasing department identifies a suitable vendor, creates a purchase order based on the purchase requisition, and sends the order to the vendor

Step three of procurement

When the vendor receives the purchase order, it ships the materials, which are received in the warehouse

Step four of procurement

The vendor then sends an invoice, which is received by the accounting department

Step five procurement

Accounting sends payment to the vendor

fulfillment process is

concerned with processing customer orders

But how can organiza-

tions determine if their business processes are well designed?

The first step is to document the process by describing its steps, its inputs and outputs, and its resources. The organization can then analyze the process and, if necessary, modify it to improve its performance.

ISs play a vital

role in three areas

Executing the process

Capturing and storing process data

Monitoring process performance

IS helps execute processes by

informing people when it is time to complete a task, by providing the necessary data to complete the task, and, in some cases, by providing the means to complete the task.

IS captures and stores these data called process data or transaction data.

dates, times, product numbers, quantities, prices, and addresses, as well as who did what, when, and where.

important advantage of using an IS compared to a manual system or multiple functional area information systems

data need to be entered into the system only once.

once they are entered, other people in the process can easily access them, and there's no need to reenter them in subsequent steps.

IS performs this role by evaluating information about a process. This information can be created either at

instance level (i.e., a specific task or activity) or at the process level (i.e., the process as a whole).

Cycle and fulfillment time reduction

The result of optimizing the manufacturing and logistics processes.

Quality

The result of optimizing the design, development, and production processes.

Differentiation

The result of optimizing the marketing and innovation processes.

business process reengineering (BPR)
strategy for making an organization's business processes more productive and profitable.
business process improvement (BPI)
focuses on reducing variation in the process outputs by searching for root causes of the variation in the process itself or among the process inputs
Six Sigma is a popular methodology for BPI initiatives
goal is to ensure that the process
has no more than 3.4 defects per million outputs by using statistical methods to analyze the process.
successful BPI project generally follows five basic phases
define, measure, analyze, improve, and control (DMAIC)
process simulation software during the analysis phase provides two benefits
enables a process manager to quickly simulate a real situation for a specific amount of time.
allows the manager to create multiple scenarios; for instance, using a different number of resources in the process and/or using a different configuration for the process steps.
sustain BPI efforts over time, organizations can adopt business process management (BPM)
management system that includes methods and tools to support the design, analysis, implementation, management, and continuous optimization of core business processes throughout the organization
components of BPM are
are process modeling, Web-enabled technologies, and business activity monitoring.
Process Modeling
graphical depiction of all of the steps in a process, it helps employees understand the interactions and dependencies among the people involved in the process, the information systems they rely on, and the information they require to optimally perform their tasks
Web-enabled technologies
display and retrieve data via a Web browser. They enable an organization to integrate the necessary people and applications into each process, across functional areas and geographical locations.
business activity monitoring (BAM)
is a real-time approach for measuring and managing business processes.
business process management suites (BPMS).
an integrated set of applications that includes a repository of process information, such as
process maps and business rules; tools for process modeling...

All IT applications require data. These data should be of high quality, meaning that they should be accurate, complete, timely, consistent, accessible, relevant, and concise. Unfortunately, the process of acquiring, keeping, and managing data is becoming increasingly difficult.

The Difficulties of Managing Data

Because data are processed in several stages and often in multiple locations, they are frequently subject to problems and difficulties. Managing data in organizations is difficult for many reasons.

First, the amount of data increases exponentially with time. Much historical data must be kept for a long time, and new data are added rapidly. For example, to support millions of customers, large retailers such as Walmart have to manage petabytes of data. (A petabyte is approximately 1,000 terabytes, or trillions of bytes; see Technology Guide 2.)

In addition, data are also scattered throughout organizations, and they are collected by many individuals using various methods and devices. These data are frequently stored in numerous servers and locations and in different computing systems, databases, formats, and human and computer languages.

Another problem is that data are generated from multiple sources: internal sources (for example, corporate databases and company documents); personal sources (for example, personal thoughts, opinions, and experiences); and external sources (for example, commercial databases, government reports, and corporate websites). Data also come from the Web, in the form of clickstream data. [Clickstream data](#) are those data that visitors and customers produce when they visit a website and click on hyperlinks (described in Chapter 6). Clickstream data provide a trail of the users' activities in the website, including user behaviour and browsing patterns.

Adding to these problems is the fact that new sources of data, such as blogs, podcasts, videocasts, and RFID tags and other wireless sensors, are constantly being developed and the data these technologies generate must be managed. In addition, data degrade over time. For example, customers move to new addresses or change their names, companies go out of business or are bought, new products are developed, employees are hired or fired, and companies expand into new countries.

Data are also subject to *data rot*. Data rot refers primarily to problems with the media on which the data are stored. Over time, temperature, humidity, and exposure to light can cause physical problems with storage media and thus make it difficult to access the data. The second aspect of data rot is that finding the machines needed to access the data can be difficult. For example, it is almost impossible today to find eight-track players. Consequently, a library of eight-track tapes has become relatively worthless, unless you have a functioning eight-track player or you can convert the tapes to a modern medium such as CDs.

Data security, quality, and integrity are critical, yet they are easily jeopardized. In addition, legal requirements relating to data differ among countries as well as among industries, and they change frequently.

Another problem arises from the fact that, over time, organizations have developed information systems for specific business processes, such as transaction processing, supply chain management, and customer relationship management. Information systems that specifically support these processes impose unique requirements on data, which results in repetition and conflicts across the organization. For example, the marketing function might maintain information on customers, sales territories, and markets. These data might be duplicated within the billing or customer service functions. This situation can produce inconsistent data within the enterprise. Inconsistent data prevent a company from developing a unified view of core business

information—data concerning customers, products, finances, and so on—across the organization and its information systems.



Two other factors complicate data management. First, federal government regulations—most significantly, Bill 198, the Canadian equivalent to the U.S. Sarbanes-Oxley Act—require companies to account for how information is being managed within their organizations. The law in Canada requires that (1) public companies evaluate and disclose the effectiveness of their internal financial controls and (2) independent auditors for these companies agree to this disclosure. The law also holds CEOs and CFOs personally responsible for such disclosures. If their companies lack satisfactory data-management policies and fraud or a security breach occurs, the company's senior managers could be held liable and face prosecution.

Second, companies are drowning in data, much of which is unstructured. As you have seen, the amount of data is increasing exponentially. To be profitable, companies must develop a strategy for managing these data effectively and that's why we devote the entire Section [10.3](#) to the topic of Big Data.

Data Governance

To address the numerous problems associated with managing data, organizations are turning to data governance. [Data governance](#) is an approach to managing information across an entire organization. It involves a formal set of business processes and policies that are designed to ensure that data are handled in a certain, well-defined fashion. That is, the organization follows unambiguous rules for creating, collecting, handling, and protecting its information. The objective is to make information available, transparent, and useful for the people who are authorized to access it, from the moment it enters an organization until it is outdated and deleted.

One strategy for implementing data governance is master data management. [Master data management](#) is a process that spans all organizational business processes and applications. It provides companies with the ability to store, maintain, exchange, and synchronize a consistent, accurate, and timely “single version of the truth” for the company's master data.

[Master data](#) are a set of core data, such as customer, product, employee, vendor, geographic location, and so on, that span the enterprise information systems. It is important to distinguish between master data and transaction data. *Transaction data*, which are generated and captured by operational systems, describe the business's activities or transactions. In contrast, master data are applied to multiple transactions and are used to categorize, aggregate, and evaluate the transaction data.

Let's look at an example of a transaction: You (Maria Pinto) purchase one Samsung 42-inch plasma television, part number 1234, from Yves Gagnon at Best Buy, for \$2,000, on April 20, 2018. In this example, the master data are “product sold,” “vendor,” “salesperson,” “store,” “part number,” “purchase price,” and “date.” When specific values are applied to the master data, then a transaction is represented. Therefore, transaction data would be, respectively, “42-inch plasma television,” “Samsung,” “Yves Gagnon,” “Best Buy,” “1234,” “\$2,000,” and “April 20, 2018.”

An example of master data management is home renovation retailer Ace Hardware, which implemented a plan for standardizing its 90,000 products' master data starting with product names and description, manufacturer names, brands, and item attributes such as dimensions, weights, and colours. This was necessary in order to improve search effectiveness, increase accuracy, and streamline new product entry into the database management system and to facilitate the processing of transactions at retail stores. The master database can be used by any of the 130 Ace Hardware stores across Canada.

How does Ace Hardware use this system? For example, if a customer walks into a store and cannot find the gardening tool that she is looking for, a sales associate can then look up if the item is out of stock. If so, the associate can find and recommend a comparable product according to the characteristics in the database of the item that is out of stock. This allows Ace Hardware to help customers select from thousands of home improvement and hardware products quickly and accurately.

Along with data governance, organizations use the database approach to efficiently and effectively manage their data. We discuss the database approach in Section [10.2](#).

From the mid-1950s, when businesses first adopted computer applications, until the early 1970s, organizations managed their data in a *file management environment*. This environment evolved because organizations typically automated their functions one application at a time. Therefore, the various automated systems developed independently from one another, without any overall planning. Each application required its own data, which were organized in a data file.

A [data file](#) (also known as a [table](#)) is a collection of logically related records. In a file management environment, each application has a specific data file related to it. This file contains all of the data records the application requires. Over time, organizations developed numerous applications, each with an associated, application-specific data file.

For example, imagine that most of your information is stored in your university's central database, but a club to which you belong maintains its own files, the athletics department has separate files for student athletes, and your instructors maintain grade data on their personal computers. It is easy for your name to be misspelled in one of these databases or files but not in others. Similarly, if you move, then your address might be updated correctly in one database or file but not in others.

Using databases eliminates many problems that arose from previous methods of storing and accessing data, such as file management systems. Databases are arranged so that one set of software programs—the database management system—provides all users with access to all of the data. (You will study database management systems later in this chapter.) Database systems minimize the following problems:

- *Data redundancy*: The same data are stored in multiple locations.
- *Data isolation*: Applications cannot access data associated with other applications.
- *Data inconsistency*: Various copies of the data do not agree.

In addition, database systems maximize the following:

- *Data security*: Because data are “put in one place” in databases, there is a risk of losing a lot of data at one time. Therefore, databases must have extremely high security measures in place to minimize mistakes and deter attacks.
- *Data integrity*: Data meet certain constraints; for example, there are no alphabetic characters in a Social Insurance Number field.
- *Data independence*: Applications and data are independent of one another; that is, applications and data are not linked to each other, so all applications are able to access the same data.

Figure [10.1](#) illustrates a university database. Note that university applications from the registrar's office, the accounting department, and the athletics department access data through the database management system. MetLife Wall is an interesting example of a database, as you see in IT's About Business [10.1](#).

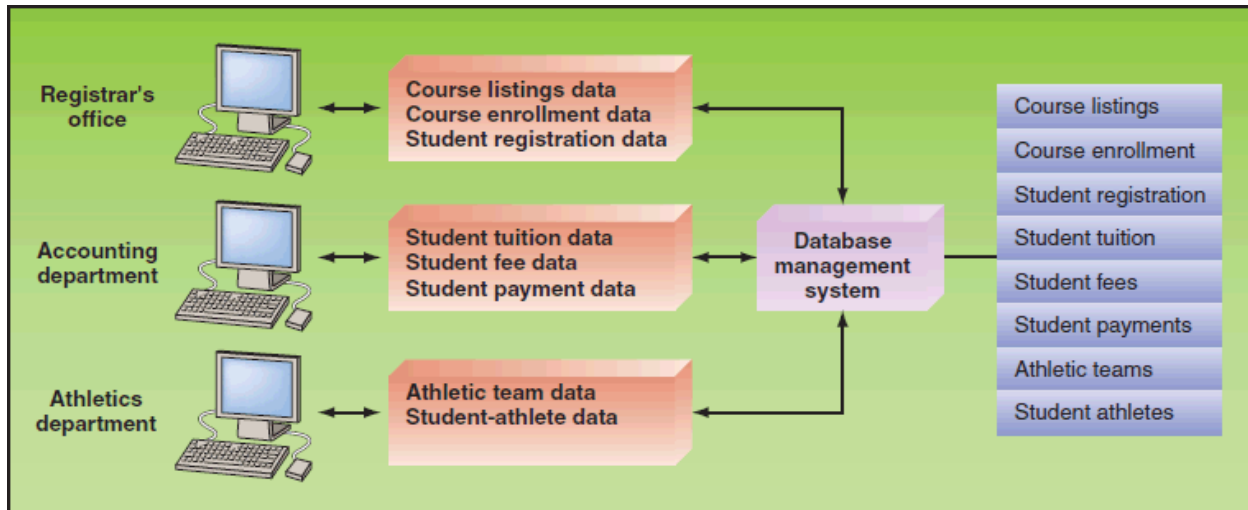


FIGURE 10.1 Database management system

IT's About Business10.1

The MetLife Wall

MIS **MKT** **POM** **HRM** Founded in 1868, the New York City-based Metropolitan Life Insurance Company (MetLife) (www.metlife.com) is among the world's largest providers of insurance, annuities, and employee benefit programs. It is now a \$68-billion company with 90 million customers in more than 60 countries. As a result of acquisitions, new products, and various software deployments over the years, MetLife amassed 70 software systems that each had their own database and could not communicate with one another. As a result, MetLife customer service representatives had difficulty communicating with policyholders. For example, they could not always tell if a client with an automobile insurance policy also had a MetLife disability plan.

MetLife staff had to integrate its separate systems and databases. Call centre staff and claims researchers had to use as many as 40 screens just to gather all of the data and documents needed to answer customer questions. That manual, time-consuming, and error-prone process decreased both worker productivity and customer satisfaction. Because MetLife offers many kinds of products—from insurance to annuities—the company needed to develop a unified, consolidated picture of its customers.

To integrate all relevant client data onto a single screen, MetLife turned to MongoDB (www.mongodb.com), a document-oriented NoSQL database. Inspired by the “wall” concept in Facebook, where a user's activities appear in one space as a timeline, MetLife called the project the MetLife Wall. Using the Wall, MetLife representatives no longer see customers merely as ID numbers scattered among different products. With one click, the MetLife Wall lets representatives see policyholders' histories, policies, their conversations with the company, and any claims filed and paid—all on a simple timeline. Representatives can settle issues more efficiently and quickly assess how a customer feels about the company. Since the company implemented MongoDB, more than 1,000 customer service representatives and claims researchers in the United States and Europe have been using MetLife's Wall successfully, as customer satisfaction has significantly gone up.

In addition to the MetLife Wall, MetLife is using MongoDB for two other applications—one internal and one external. The first is an internal recruiting app to store resumés, which makes them easier to analyze than if they had been stored in Word files or PDFs. Next, MetLife deployed a mobile app for customers that allowed them to upload documents, videos, photos, and other content that they could designate to be shared only with selected individuals at some future date. For example, after a policyholder passes away, their beneficiaries can access their life insurance policy.

Sources: Compiled from “MetLife Honored as Celent 2014 Model Insurer of the Year,” *MetLife Global Technology & Operations*, April 14, 2014; “5 Lessons Learned from the MetLife Wall,” *Insurance Networking News*, May 1, 2014; J. Alsever, “At MetLife, Technology Is the Best Policy,” *Fortune*, October 31, 2013; “Built in Record Time, the MetLife Wall Knocks Down Barriers to Great Customer Service,” *MetLife Global Technology & Operations*, October 23, 2013; J. Furrier, “MetLife’s Big Data Revolution,” *Forbes*, October 11, 2013; D. Henschen, “When NoSQL Makes Sense,” *InformationWeek*, December 3, 2013; D. Harris, “The Promise of Better Data Has MetLife Investing \$300 M in New Tech,” *GigaOM*, May 7, 2013; www.metlife.com, accessed February 27, 2015.

Questions

1.

Describe the problems that MetLife was experiencing with customer data before it implemented the MetLife Wall.

2.

What are the benefits of the database approach for MetLife Wall?

A database can contain vast amounts of data. To make these data more understandable and useful, they are arranged in a hierarchy. We take a closer look at this hierarchy in the next section.

The Data Hierarchy

Data are organized in a hierarchy that begins with bits and proceeds all the way to databases (see Figure 10.2). A **bit** (binary digit) represents the smallest unit of data a computer can process. The term *binary* means that a bit can consist only of a 0 or a 1. A group of eight bits, called a **byte**, represents a single character. A byte can be a letter, a number, or a symbol. A logical grouping of characters into a word, a small group of words, or an identification number is called a **field**. For example, a student's name in a university's computer files would appear in the “name” field, and her or his Social Insurance Number would appear in the “Social Insurance Number” field. Fields can also contain data other than text and numbers. They can contain an image, or any other type of multimedia. Examples are a motor vehicle department's licensing database that contains a driver's photograph and a field that contains a voice sample to authorize access to a secure facility.

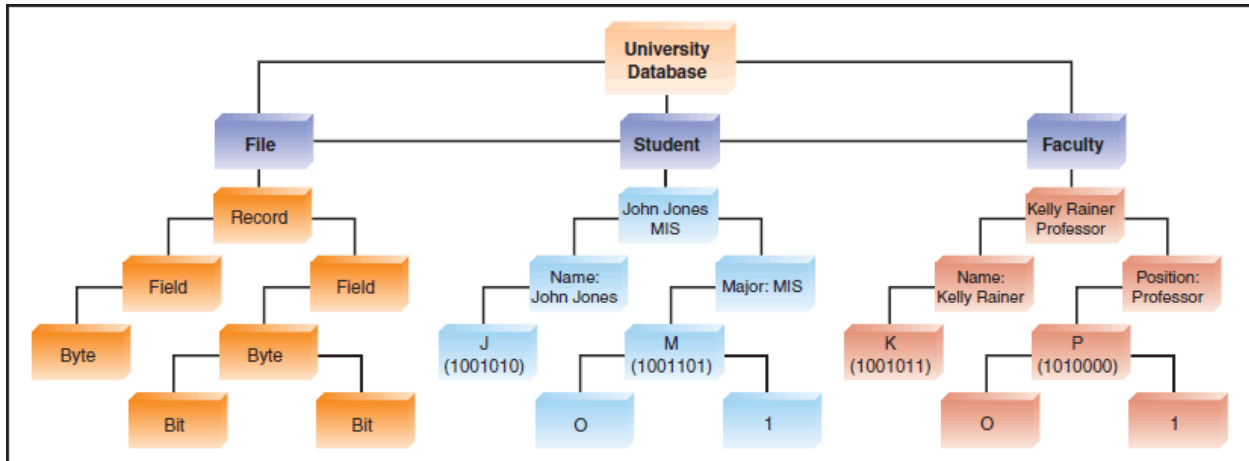


FIGURE 10.2 Hierarchy of data for a computer-based file

A logical grouping of related fields, such as the student's name, the courses taken, the date, and the grade, composes a [record](#). In the Apple iTunes Store, a song is a field in a record, with other fields containing the song's title, its price, and the album on which it appears. As mentioned, a logical grouping of related records is called a data file or a table. For example, a grouping of the records from a particular course, consisting of course number, professor, and students' grades, would constitute a data file for that course. Continuing up the hierarchy, a logical grouping of related files constitutes a *database*. Using the same example, the student course file could be grouped with files on students' personal histories and financial backgrounds to create a student database. In the next section, you will learn about a relational database model.

Database Management Systems



[Video Lesson: The Relational Database Model](#)

[Video Lesson: The Relational Database Model](#)

[Video Lesson: Database Management Systems](#)

[Video Lesson: Database Management Systems](#)

A [database management system \(DBMS\)](#) is a set of programs that provide users with tools to create and manage a database. Managing a database involves adding, deleting, accessing, modifying, and analyzing data stored in a database. An organization can access the data by using query and reporting tools that are part of the DBMS or by using application programs specifically written to perform this function. DBMSs also provide the mechanisms for maintaining the integrity of stored data, managing security and user access, and recovering information if the system fails. Because databases and DBMSs are essential to all areas of business, they must be carefully managed.

There are a number of different database architectures, but we focus on the relational database model because it is popular and easy to use. Other database models (for example, the hierarchical and network models) are the responsibility of the MIS function and are not used by organizational employees. Popular examples of relational databases are Microsoft Access and Oracle.

Most business data—especially accounting and financial data—traditionally were organized into simple tables consisting of columns and rows. Tables allow people to compare information quickly by row or column. In addition, users can retrieve items rather easily by locating the point of intersection of a particular row and column.

The [relational database model](#) is based on the concept of two-dimensional tables. A relational database generally is not one big table—usually called a *flat file*—that contains all of the records and attributes. Such a design would entail far too much data redundancy. Instead, a relational database is usually designed with a number of related tables. Each of these tables contains records (listed in rows) and attributes (listed in columns).

To be valuable, a relational database must be organized so that users can retrieve, analyze, and understand the data they need. A key to designing an effective database is the data model. A [data model](#) is a diagram that represents entities in the database and their relationships. An [entity](#) is a person, place, thing, or event—such as a customer, an employee, or a product—about which information is maintained. Entities can typically be identified in the user's work environment. A record generally describes an entity. An [instance](#) of an entity is each row in a relational table, which is a specific, unique representation of the entity. For example, your university's student database contains an entity called STUDENT. An instance of the STUDENT entity would be a particular student. For example, you are an instance of the STUDENT entity in your university's student database.

Each characteristic or quality of a particular entity is called an [attribute](#). For example, if our entities were a customer, an employee, and a product, entity attributes would include customer name, employee number, and product colour.

Consider the relational database example about students diagrammed in Figure [10.3](#). The table contains data about the entity called students. As you can see, each row of the table corresponds to one student record. (You have your own row in your university's student database.) Attributes of the entity are student name, undergraduate major, grade point average, and graduation date. The rows are the records on Sally Adams, John Jones, Jane Lee, Kevin Durham, Juan Rodriguez, Stella Zubnicki, and Ben Jones. Of course, your university keeps much more data on you than our example shows. In fact, your university's student database probably keeps hundreds of attributes on each student.

Microsoft Access

File Edit View Insert Format Records Tools Window Help

Student Name Arial 10

Type a question for help

Table1 : Table

Student Name	Student ID	Major	GPA	Graduation Date
Sally Adams	111-12-4321	Finance	2.94	5/12/2018
John Jones	420-33-9834	Accounting	3.45	12/5/2018
Jane Lee	241-35-7432	MIS	3.17	5/12/2018
Kevin Durham	021-79-6679	Economics	2.77	5/12/2018
Juan Rodriguez	335-77-5124	Marketing	3.52	12/5/2018
Stella Zubnicki	408-99-5798	Operations Man	3.37	8/5/2018
Ben Jones	422-89-0011	Finance	3.11	5/12/2018

Record: 8 of 8

db2 : D...

Datasheet View

FIGURE 10.3 Student database example

Every record in the database must contain at least one field that uniquely identifies that record so that it can be retrieved, updated, and sorted. This identifier field (or attribute) is called the [primary key](#). For example, a student record in a university would use a unique student number as its primary key. (Note: In the past, your Social Insurance Number served as the primary key for your student record. However, for information privacy reasons, this practice has been discontinued.) You see that Sally Adams is uniquely identified by her student ID of 111-12-4321.

In some cases, locating a particular record requires the use of secondary keys. A [secondary key](#) is another field that has some identifying information, but typically does not identify the record with complete accuracy. For example, the student's major might be a secondary key if a user wanted to identify all of the students majoring in a particular field of study. It should not be the primary key, however, because many students can have the same major. Therefore, it cannot uniquely identify an individual student.

A [foreign key](#) is a field (or group of fields) in one table that uniquely identifies a row of another table. A foreign key is used to establish and enforce a link between two tables. We discuss foreign keys in more detail in the Appendix to this chapter.

Organizations implement databases to efficiently and effectively manage their data. There are a variety of operations that can be performed on databases. We look at three of these operations in detail in the Appendix to this chapter: query languages, normalization, and joins.

As we noted earlier in this chapter, organizations must manage huge quantities of data. Such data consist of structured and unstructured data and are called Big Data (discussed in Section [10.3](#)). To manage Big Data, many organizations are using special types of databases, which we also discuss in Section [10.3](#).

Because databases typically process data in real time (or near real time), it is not practical to allow users access to the databases. After all, the data will change while the user is looking at them! As a result, data warehouses have been developed to allow users to access data for decision making. You will learn about data warehouses in Section [10.4](#).

We are accumulating data and information at an increasingly rapid pace from many diverse sources. In fact, organizations are capturing data about almost all events—including events that, in the past, firms never used to think of as data at all, such as a person's location, the vibrations and temperature of an engine, and the stress at numerous points on a bridge—and then analyzing those data.

Organizations and individuals must process a vast amount of data that continues to rapidly increase. According to IDC (a technology research firm; www.idc.com), the world generates exabytes of data each year (an exabyte is 1 trillion terabytes). Furthermore, the amount of data produced worldwide is increasing by 50 percent each year. As we discussed at the beginning of the chapter, we refer to the superabundance of data available today as Big Data. That is, [Big Data](#) is a collection of data so large and complex that it is difficult to manage using traditional database management systems. (We capitalize *Big Data* to distinguish the term from large amounts of traditional data.)

Essentially, Big Data is about predictions. Predictions do not come from “teaching” computers to “think” like humans. Instead, predictions come from applying mathematics to huge quantities of data to infer probabilities. Consider the following examples:

- The likelihood that an email message is spam.
- The likelihood that the typed letters “teh” are supposed to be “the.”
- The likelihood that the trajectory and velocity of a person jaywalking indicate that he will make it across the street in time, meaning that a self-driving car need only slow down slightly.

Big Data systems perform well because they contain huge amounts of data on which to base their predictions. Moreover, these systems are configured to improve themselves over time by searching for the most valuable signals and patterns as more data are input.

Defining Big Data

It is difficult to define Big Data. Here we present two descriptions of the phenomenon. First, the technology research firm Gartner (www.gartner.com) defines Big Data as diverse, high-volume, high-velocity information assets that require new forms of processing to enable enhanced decision making, insight discovery, and process optimization. Second, The Big Data Institute (<https://thebigdatainstitute.wordpress.com>) defines Big Data as vast data sets that perform the following:

- Exhibit variety.
- Include structured, unstructured, and semi-structured data.
- Are generated at high velocity with an uncertain pattern.
- Do not fit neatly into traditional, structured, relational databases.
- Can be captured, processed, transformed, and analyzed in a reasonable amount of time only by sophisticated information systems.

As recently as the year 2000, only 25 percent of the stored information in the world was digital. The other 75 percent was analogue; that is, it was stored on paper, film, vinyl records, and the like. By 2016, the amount of stored information in the world was over 98 percent digital and less than 2 percent analogue.

Big Data generally consists of the following:

- *Traditional enterprise data*: Examples are customer information from customer relationship management systems, transactional enterprise resource planning data, web store transactions, operations data, and general ledger data.
- *Machine-generated/sensor data*: Examples are smart meters; manufacturing sensors; sensors integrated into smart phones, automobiles, airplane engines, and industrial machines; equipment logs; and trading systems data.
- *Social data*: Examples are customer feedback comments; microblogging sites such as Twitter; and social media sites such as Facebook, YouTube, and LinkedIn.
- Images captured by billions of devices located throughout the world, from digital cameras and camera phones to medical scanners and security cameras.

Let's take a look at a few specific examples of Big Data:

- In 2016, Google was processing more than 27 petabytes of data every day.
- Facebook members upload more than 10 million new photos every hour. In addition, they click a “like” button or leave a comment nearly 3 billion times every day.
- The 800 million monthly users of Google's YouTube service upload more than an hour of video every second.
- The number of messages on Twitter is growing at 200 percent every year. By early 2016, the volume exceeded 550 million tweets per day.

Characteristics of Big Data

Big Data has three distinct characteristics: volume, velocity, and variety. These characteristics distinguish Big Data from traditional data.

- *Volume*: We have noted the huge volume of Big Data. Consider machine-generated data, which are generated in much larger quantities than non-traditional data. For instance, sensors in a single jet engine can generate 10 terabytes of data in 30 minutes. (See our discussion of the Internet of Things in Chapter 8.) With more than 25,000 airline flights per day, the daily volume of data from just this single source is incredible. Smart electrical meters, sensors in heavy industrial equipment, and telemetry from automobiles compound the volume problem.
- *Velocity*: The rate at which data flow into an organization is rapidly increasing. Velocity is critical because it increases the speed of the feedback loop between a company, its customers, its suppliers, and its business partners. For example, the Internet and mobile technology enable online retailers to compile histories not only on final sales but also on their customers' every click and interaction. Companies that can quickly utilize that information—for example, by recommending additional purchases—gain competitive advantage.
- *Variety*: Traditional data formats tend to be structured and relatively well described, and they change slowly. Traditional data include financial market data, point-of-sale transactions, and much more. In contrast, Big Data formats change rapidly. They include satellite imagery, broadcast audio streams, digital music files, web page content, scans of government documents, and comments posted on social networks.

Irrespective of its source, structure, format, and frequency, Big Data is valuable. If certain types of data appear to have no value today, it is because we have not yet been able to analyze them effectively. For example, several years ago when Google began harnessing satellite imagery, capturing street views, and then sharing these geographical data for free, few people

understood its value. Today, we recognize that such data are incredibly valuable because analyses of Big Data yield deep insights. We discuss analytics in detail in Chapter 12.

Issues with Big Data

Despite its extreme value, Big Data does have issues. In this section, we take a look at data integrity, data quality, and the nuances of analysis that are worth noting.

- **Big Data can come from untrusted sources:** As we discussed above, one of the characteristics of Big Data is variety, meaning that Big Data can come from numerous, widely varied sources. These sources may be internal or external to the organization. For instance, a company might want to integrate data from unstructured sources such as emails, call centre notes, and social media posts with structured data about its customers from its data warehouse. The question is: How trustworthy are those external sources of data? For example, how trustworthy is a tweet? The data may come from an unverified source. Further, the data itself, reported by the source, can be false or misleading.
- **Big Data is “dirty”:** Dirty data are data that are inaccurate, incomplete, incorrect, duplicate, or erroneous. Examples of such problems are misspellings of words and duplicate data such as retweets or company press releases that appear numerous times in social media.

Suppose a company is interested in performing a competitive analysis using social media data. The company wants to see how often a competitor's product appears in social media outlets as well as the sentiments associated with those posts. The company notices that the number of positive posts about the competitor is twice as large as the number of positive posts about itself. This could simply be a case where the competitor is pushing out its press releases to multiple sources, in essence “blowing its own horn.”

Alternatively, the competitor could be getting many people to retweet an announcement.

- **Big Data changes, especially in data streams:** Organizations must be aware that data quality in an analysis can change, or the data itself can change, because the conditions under which the data are captured can change. For instance, imagine a utility company that analyzes weather data and smart-meter data to predict customer power usage. What happens when the utility is analyzing these data in real time and it discovers data missing from some of its smart meters?

Managing Big Data



Video Lesson: Managing and Leveraging Big Data **Video Lesson: Managing and Leveraging Big Data**

Big Data makes it possible to do many things that were previously impossible; for example, to spot business trends more rapidly and accurately, prevent disease, track crime, and so on. When properly analyzed, Big Data can reveal valuable patterns and information that were previously hidden because of the amount of work required to discover them. Leading corporations, such as Walmart and Google, have been able to process Big Data for years, but only at great expense. Today's hardware, cloud computing (see Technology Guide 4), and open-source software make processing Big Data affordable for most organizations.

The first step for many organizations toward managing data was to integrate information silos into a database environment and then to develop data warehouses for decision making. (An information silo is an information system that does not communicate with other, related

information systems in an organization.) After completing this step, many organizations turned their attention to the business of information management—making sense of their proliferating data. In recent years, Oracle, IBM, Microsoft, and SAP have spent billions of dollars purchasing software firms that specialize in data management and business intelligence. (You will learn about business intelligence in Chapter 12.)

In addition to existing data-management systems, today many organizations employ NoSQL databases to process Big Data. Think of them as “not only SQL” (structured query language) databases. (We discuss SQL in Section [10.6](#).)

As you have seen in this chapter, traditional relational databases such as Oracle and MySQL store data in tables organized into rows and columns. Recall that each row is associated with a unique record and each column is associated with a field that defines an attribute of that account.

In contrast, NoSQL databases can manipulate structured as well as unstructured data and inconsistent or missing data. For this reason, NoSQL databases are particularly useful when working with Big Data. Many products use NoSQL databases, including Cassandra (<http://cassandra.apache.org>), CouchDB (<http://couchdb.apache.org>), MongoDB (www.mongodb.org), and Hadoop (<http://hadoop.apache.org>).

Putting Big Data to Use

Organizations must manage Big Data and gain value from it. There are several ways to do this.

Making Big Data Available

Making Big Data available for relevant stakeholders can help organizations gain value. For example, consider open data in the public sector. Open data are accessible public data that individuals and organizations can use to create new businesses and solve complex problems. In particular, government agencies gather very large amounts of data, some of which is Big Data. Making that data available can provide economic benefits. IT's About Business [10.2](#) provides the example of Google's Big Data project called Knowledge Graph.

IT's About Business10.2

Google's Knowledge Graph

MIS Conventional technology behind search engines such as Google (www.google.com) uses algorithms that look for pages that contain the search terms, rather than the meaning behind the terms. Google's algorithms first check previous searches from other users using the same terms to determine which words in the query are most likely to be important, based on how often they have been used. Next, the software accesses a list of web pages that contain information related to these search terms. Finally, the search engine ranks the results and displays them to the user.

Newer technology from Google tries to uncover the meaning behind search terms. Google's Knowledge Graph, which began when it bought a start-up called Metaweb in 2010, is a vast database that enables Google software to connect facts on people, places, and things to one another. The Knowledge Graph will enable Google's future products to better understand the people who use them and the things they care about. Searchers will be able to use information gathered by the Knowledge Graph to answer their queries without having to navigate to other sites and assemble information themselves.

When Google began the Knowledge Graph project in 2010, Metaweb contained only 12 million entries. Today, the Knowledge Graph has more than 600 million entries containing more than 18 billion links.

Google designed the Knowledge Graph to examine queries in a much more sophisticated way and directly retrieve relevant information, although it still uses data from past searches to determine what might be the most relevant. The Knowledge Graph adds useful context and detail to the list of displayed links. Searching for certain people, places, or things produces a box of facts alongside the regular search results.

The Knowledge Graph has uses beyond a typical query. For example, Google has integrated Knowledge Graph into YouTube (www.youtube.com), where it arranges videos by topic and suggests similar videos to the ones just watched. Within news articles, the Knowledge Graph can also connect and recommend news articles based on specific facts mentioned in the stories.

The Knowledge Graph is a database that represents Google's knowledge of the world. A good analogy for the Knowledge Graph is maps. A map is based on a database of real-world information, outlining streets, rivers, countries, and other physical entities. Therefore, a map is a structure for the physical world.

The Knowledge Graph provides such a structure for the world of ideas and knowledge. For example, Google's Knowledge Graph maps out information on foods, products, philosophy and history, famous people, and myriad others. The relationships among entities enable the Knowledge Graph to determine, for example, that these two people are married, that this place is located in this country, or that this person appears in this movie.

Google's understanding of the information uncovered in the Knowledge Graph grows as it crawls and indexes documents, analyzing every item of information within the Knowledge Graph's context. For example, if the document is about famous chefs, the Knowledge Graph knows it is about food and cooking.

Sources: Compiled from J. DeMers, "What Google's Knowledge Graph Means for the Future of Search," *Forbes*, October 28, 2014; J. Kahn, "Google Adds Video Game Data to Knowledge Graph in Search Results," *Techspot*, October 24, 2014; T. Simonite, "How a Database of the World's Knowledge Shapes Google's Future," *MIT Technology Review*, January 27, 2014; S. Perez, "Google's Knowledge Graph Now Being Used to Enhance Search Results," *TechCrunch*, January 22, 2014; A. Orlowski, "Google Stabs Wikipedia in the Front," *The Register*, January 13, 2014; G. Kohs, "Google's Knowledge Graph Boxes: Killing Wikipedia?", *Wikipediocracy*, January 6, 2014.

Questions

1.

What is the relationship between Big Data and Google's Knowledge Graph?

2.

Provide two examples not contained in the case that businesses could make use of with Google's Knowledge Graph.

Enabling Organizations to Conduct Experiments

Big Data allows organizations to improve performance by conducting controlled experiments. For example, Amazon (and many other companies such as Google and LinkedIn) constantly experiments by offering slightly different "looks" on its website. These experiments are called A/B experiments, because each experiment has only two possible outcomes. Here is an example of an A/B experiment at Etsy.com, an online marketplace for vintage and handmade products.

MKT When Etsy analysts noticed that one of its web pages attracted customer attention but failed to keep it, they looked more closely at the page. They found that the page had few "calls to

action.” (A call to action is an item, such as a button, on a web page that enables a customer to do something.) On this particular Etsy page, customers could leave, buy, search, or click on two additional product images. The analysts decided to show more product images on the page.

Consequently, one group of visitors to the page saw a strip across the top of the page that displayed additional product images. Another group of page visitors saw only the two original product images. On the page with additional images, customers viewed more products and bought more products. The results of this experiment revealed valuable information to Etsy.

Microsegmenting Customers

Segmentation of a company's customers means dividing them into groups that share one or more characteristics. Microsegmentation simply means dividing customers into very small groups, or even down to the individual level.

MKT For example, Paytronix Systems (www.paytronix.com) provides loyalty and rewards program software to thousands of different restaurants. Paytronix gathers restaurant guest data from a variety of sources beyond loyalty and gift programs, including social media. Paytronix analyzes Big Data to help its restaurant clients microsegment their guests. Restaurant managers are now able to more precisely customize their loyalty and gift programs. In doing so, the managers are noting improved performance in their restaurants in terms of profitability and customer satisfaction.

Creating New Business Models

POM Companies are able to use Big Data to create new business models. For example, a commercial transportation company operated a large fleet of large, long-haul trucks. The company recently placed sensors on all its trucks. These sensors wirelessly communicate large amounts of information to the company, a process called telematics. The sensors collect data on vehicle usage (including acceleration, braking, cornering, etc.), driver performance, and vehicle maintenance.

By analyzing Big Data, the transportation company was able to improve the condition of its trucks through near-real-time analysis that proactively suggested preventive maintenance. In addition, the company was able to improve the driving skills of its operators by analyzing their driving styles.

The transportation company then made its Big Data available to its insurance carrier. Using these data, the insurance carrier performed risk analysis on driver behaviour and the condition of the trucks, resulting in a more precise assessment. The insurance carrier offered the transportation company a new pricing model that lowered the transportation company's premiums by 10 percent.

Being Able to Analyze More Data

In some cases, organizations can use Big Data to process all the data relating to a particular phenomenon, meaning that they do not have to rely as much on sampling. Random sampling works well, but it is not as effective as analyzing an entire dataset. In addition, random sampling has some basic weaknesses. To begin with, its accuracy depends on ensuring randomness when collecting the sample data. However, achieving such randomness is problematic. Systematic biases in the process of data collection can cause the results to be highly inaccurate. For example, consider political polling using landline phones. This sample tends to exclude people who use only cell phones. This bias can seriously skew the results.

Big Data Used in the Functional Areas of the Organization

In this section, we provide examples of how Big Data is valuable to various functional areas in the firm.

Human Resources

HRM Employee benefits, particularly health care, represent a major business expense. Consequently, some companies have turned to Big Data to better manage these benefits. Caesars Entertainment (www.caesars.com), for example, analyzes health-insurance claim data for its 65,000 employees and their covered family members. Managers can track thousands of variables that indicate how employees use medical services, such as the number of emergency room visits and whether employees choose a generic or brand name drug.

Consider the following scenario: Data revealed that too many employees with medical emergencies were being treated at hospital emergency rooms rather than at less-expensive urgent-care facilities. The company launched a campaign to remind employees of the high cost of emergency room visits, and they provided a list of alternative facilities. Subsequently, 10,000 emergencies shifted to less-expensive alternatives, for a total savings of \$4.5 million.

Big Data is also having an impact on *hiring*. An example is Catalyst DevWorks (<http://catalystdevworks.com>), a technology outsourcing company that hires teams for programming jobs. Traditional recruiting is typically too slow, and hiring managers often subjectively choose candidates who are not the best fit for the job. Catalyst addresses this problem by requiring candidates to fill out an online assessment. It then uses the assessment to collect thousands of data points about each candidate. In fact, the company collects more data based on *how* candidates answer than on *what* they answer.

For example, the assessment might give a problem requiring calculus to an applicant who is not expected to know the subject. How the candidate responds—labouring over an answer, answering quickly and then returning later, or skipping the problem entirely—provides insight into how that candidate might deal with challenges that he or she will encounter on the job. That is, someone who labours over a difficult question might be effective in an assignment that requires a methodical approach to problem solving, whereas an applicant who takes a more aggressive approach might perform better in a different job setting.

The benefit of this Big-Data approach is that it recognizes that people bring different skills to the table and that there is no one-size-fits-all person for any job. Analyzing millions of data points can reveal which attributes candidates bring to specific situations.

As one measure of success, employee turnover at Catalyst averages about 15 percent per year, compared with more than 30 percent for its U.S. competitors and more than 20 percent for similar companies overseas.

Product Development

MKT Big Data can help capture customer preferences and put that information to work in designing new products. For example, Ford Motor Company (www.ford.com) was considering a “three-blink” turn indicator that had been available on its European cars for years. Unlike the turn signals on its U.S. vehicles, this indicator flashes three times at the driver's touch and then automatically shuts off.

Ford decided that conducting a full-scale market research test on this blinker would be too costly and time consuming. Instead, it examined auto-enthusiast websites and owner forums to discover what drivers were saying about turn indicators. Using text-mining algorithms, researchers culled more than 10,000 mentions and then summarized the most relevant comments.

The results? Ford introduced the three-blink indicator on the new Ford Fiesta in 2010, and by 2013 it was available on most Ford products. Although some Ford owners complained online that they have had trouble getting used to the new turn indicator, many others defended it. Ford

managers note that the use of text-mining algorithms was critical in this effort because they provided the company with a complete picture that would not have been available using traditional market research.

Operations

POM For years, companies have been using information technology to make their operations more efficient. Consider United Parcel Service (UPS). The company has long relied on data to improve its operations. Specifically, it uses sensors in its delivery vehicles that can, among other things, capture the truck's speed and location, the number of times it is placed in reverse, and whether the driver's seat belt is buckled. These data are uploaded at the end of each day to a UPS data centre, where they are analyzed overnight. By combining GPS information and data from sensors installed on more than 46,000 vehicles, UPS reduced fuel consumption by 32 million litres, and it cut 137 million kilometres off its routes.

Marketing

MKT Marketing managers have long used data to better understand their customers and to target their marketing efforts more directly. Today, Big Data enables marketers to craft much more personalized messages.

The UK's InterContinental Hotels Group (IHG) (www.ihg.com) has gathered details about the members of its Priority Club rewards program, such as income levels and whether members prefer family-style or business-traveller accommodations. The company then consolidated all such information with information obtained from social media into a single data warehouse. Using its data warehouse and analytics software, the hotelier launched a new marketing campaign. Where previous marketing campaigns generated, on average, between 7 and 15 customized marketing messages, the new campaign generated more than 1,500. IHG rolled out these messages in stages to an initial core of 12 customer groups, each of which is defined by 4,000 attributes. One group, for instance, tends to stay on weekends, redeem reward points for gift cards, and register through IHG marketing partners. Utilizing this information, IHG sent these customers a marketing message that alerted them to local weekend events.

The campaign proved to be highly successful. It generated a 35-percent higher rate of customer conversions, or acceptances, than previous similar campaigns.

Government Operations

With 55 percent of the population of the Netherlands living under the threat of flooding, water management is critically important to the Dutch government. The government operates a sophisticated water management system, managing a network of dykes or levees, canals, locks, harbours, dams, rivers, storm-surge barriers, sluices, and pumping stations.

In its water management efforts, the government makes use of a vast number of sensors embedded in every physical structure used for water control. The sensors generate at least 2 petabytes of data annually. As the sensors are becoming cheaper, the government is deploying more of them, increasing the amount of data generated.

In just one example of the use of sensor data, sensors in dykes can provide information on the structure of the dyke, how well it is able to handle the stress of the water it controls, and whether it is likely to fail. Further, the sensor data are providing valuable insights for new designs for Dutch dykes. The result is that Dutch authorities have reduced the costs of managing water by 15 percent.

Today, the most successful companies are those that can respond quickly and flexibly to market changes and opportunities. A key to this response is the effective and efficient use of data and information by analysts and managers. The challenge is providing users with access to corporate

data so that they can analyze the data to make better decisions. Let's look at an example. If the manager of a local bookstore wanted to know the profit margin on used books at her store, she could obtain that information from her database, using SQL or query by example (QBE). However, if she needed to know the trend in the profit margins on used books over the past 10 years, she would have to construct a very complicated SQL or QBE query. (SQL and QBE are explained in the Appendix to this chapter.)

This example illustrates several reasons why organizations are building data warehouses and/or data marts. First, the bookstore's databases contain the necessary information to answer the manager's query, but this information is not organized in a way that makes it easy for her to find what she needs. Second, the organization's databases are designed to process millions of transactions every day. Therefore, complicated queries might take a long time to answer, and they also might degrade the performance of the databases. Third, transactional databases are designed to be updated. This update process requires extra processing. Data warehouses and data marts are read-only, and the extra processing is eliminated because data already contained in the data warehouse are not updated. Fourth, transactional databases are designed to access a single record at a time. Data warehouses are designed to access large groups of related records.

As a result of these problems, companies are using a variety of tools with data warehouses and data marts to make it easier and faster for users to access, analyze, and query data. You will learn about these tools in Chapter 12 on business intelligence.

Characteristics of Data Warehouses and Data Marts



Video Lesson: Characteristics of Data Warehouses and Data Marts **Video Lesson: Characteristics of Data Warehouses and Data Marts**

In general, data warehouses and data marts support business intelligence (BI) applications. As you will see in Chapter 12, business intelligence encompasses a broad category of applications, technologies, and processes for gathering, storing, accessing, and analyzing data to help business users make better decisions. A [data warehouse](#) is a repository of historical data that are organized by subject to support decision makers in the organization.

Because data warehouses are so expensive, they are used primarily by large companies. A [data mart](#) is a low-cost, scaled-down version of a data warehouse that is designed for the end-user needs in a strategic business unit (SBU) or an individual department. Data marts can be implemented more quickly than data warehouses, often in less than 90 days. Further, they support local rather than central control by conferring power on the user group. Typically, groups that need a single or a few BI applications require only a data mart, rather than a data warehouse.

The basic characteristics of data warehouses and data marts include the following:

- *Organized by business dimension or subject:* Data are organized by subject—for example, by customer, vendor, product, price level, and region. This arrangement differs from transactional systems, where data are organized by business process, such as order entry, inventory control, and accounts receivable.
- *Use online analytical processing (OLAP):* Involves the analysis of accumulated data by end users. We consider OLAP in greater detail in Chapter 12. Typically, organizational databases are oriented toward handling transactions. That is, databases use *online transaction processing* (OLTP), where business transactions are processed online as soon as they occur. The objectives are speed and efficiency, which are critical to a successful Internet-based business operation. Data warehouses and data marts, which are designed to support decision makers but not OLTP, use online analytical processing.

- **Integrated:** Data are collected from multiple systems and then integrated around subjects. For example, customer data may be extracted from internal (and external) systems and then integrated around a customer identifier, thereby creating a comprehensive view of the customer.
- **Time variant:** Data warehouses and data marts maintain historical data (i.e., data that include time as a variable). Unlike transactional systems, which maintain only recent data (such as for the last day, week, or month), a warehouse or mart may store years of data. Organizations use historical data to detect deviations, trends, and long-term relationships.
- **Nonvolatile:** Data warehouses and data marts are nonvolatile—that is, users cannot change or update the data. Therefore, the warehouse or mart reflects history, which, as we just saw, is critical for identifying and analyzing trends. Warehouses and marts are updated, but through IT-controlled load processes rather than by users.
- **Multidimensional:** Typically, the data warehouse or mart uses a multidimensional data structure. Recall that relational databases store data in two-dimensional tables. In contrast, data warehouses and marts store data in more than two dimensions. For this reason, the data are said to be stored in a [multidimensional structure](#). A common representation for this multidimensional structure is the *data cube*.

The data in data warehouses and marts are organized by *business dimensions*, which are subjects such as product, geographic area, and time period that represent the edges of the data cube. If you look ahead briefly to Figure [10.6](#) for an example of a data cube, you see that the product dimension comprises nuts, screws, bolts, and washers; the geographic area dimension comprises East, West, and Central; and the time period dimension comprises 2016, 2017, and 2018. Users can view and analyze data from the perspective of these business dimensions. This analysis is intuitive because the dimensions are presented in business terms that users can easily understand.

A Generic Data Warehouse Environment



[Video Lesson: A Generic Data Warehouse Environment Part 1](#)

[Video Lesson: A Generic Data Warehouse Environment Part 1](#)

[Video Lesson: A Generic Data Warehouse Environment Part 2](#)

[Video Lesson: A Generic Data Warehouse Environment Part 2](#)

[Video Lesson: A Generic Data Warehouse Environment Part 3](#)

[Video Lesson: A Generic Data Warehouse Environment Part 3](#)

The environment for data warehouses and marts includes the following:

- Source systems that provide data to the warehouse or mart.
- Data-integration technology and processes that prepare the data for use.
- Different architectures for storing data in an organization's data warehouse or data marts.
- Different tools and applications for the variety of users. (You will learn about these tools and applications in Chapter 12.)
- Metadata, data quality, and governance processes that ensure that the warehouse or mart meets its purposes.

Figure [10.4](#) depicts a generic data warehouse/data mart environment. Let's drill down into the component parts.

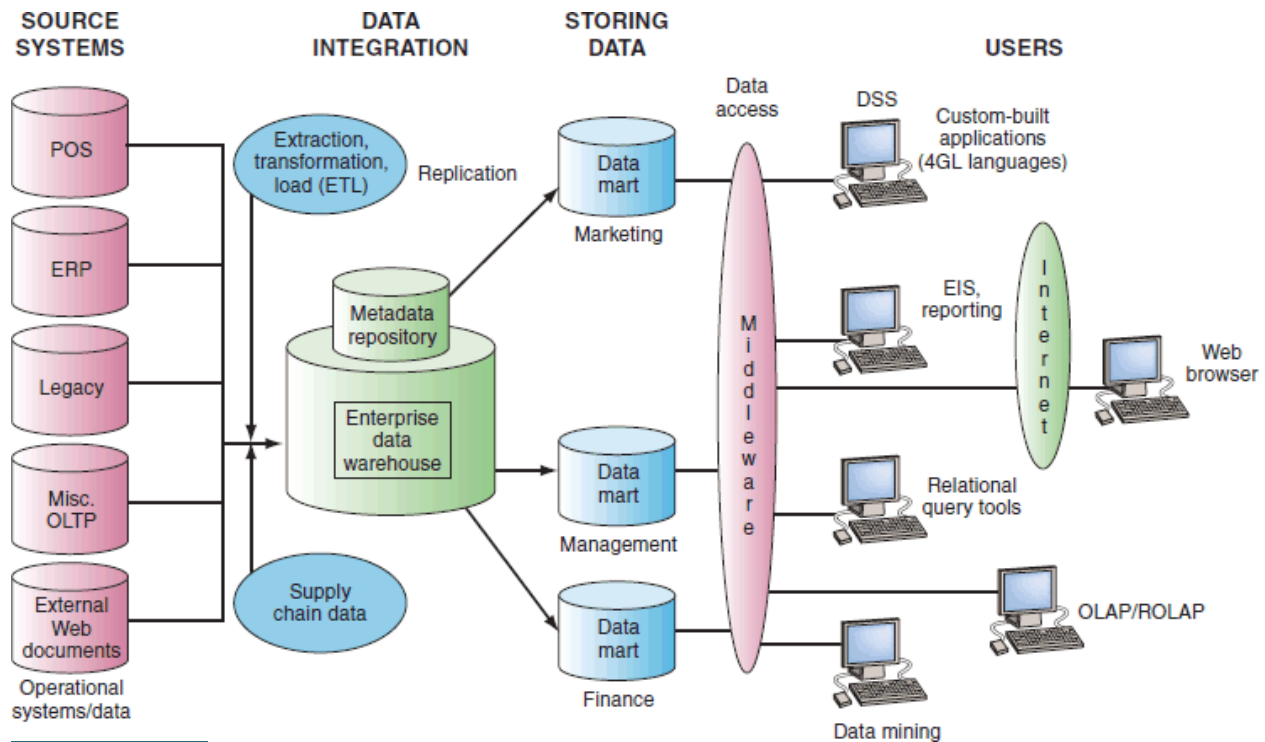


FIGURE 10.4 Data warehouse framework

Source Systems

There is typically some “organizational pain” (i.e., business need) that motivates a firm to develop its BI capabilities. Working backward, this pain leads to information requirements, BI applications, and source system data requirements. The data requirements can range from a single source system, as in the case of a data mart, to hundreds of source systems, as in the case of an enterprise-wide data warehouse.

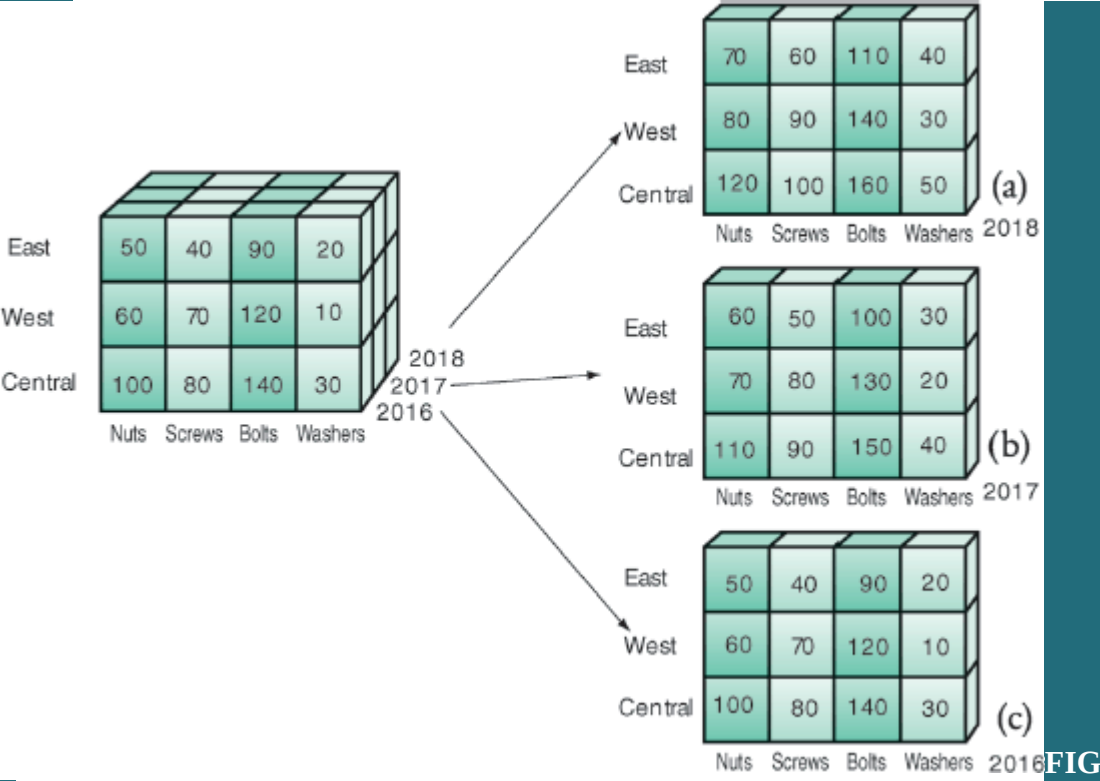
Modern organizations can select from a variety of source systems: operational/transactional systems, enterprise resource planning (ERP) systems, website data, third-party data (e.g., customer demographic data), and more. The trend is to include more types of data (e.g., sensing data from RFID tags). These source systems often use different software packages (e.g., IBM, Oracle) and store data in different formats (e.g., relational, hierarchical).

A common source for the data in data warehouses is the company's operational databases, which can be relational databases. To differentiate between relational databases and multidimensional data warehouses and marts, imagine your company manufactures four products—nuts, screws, bolts, and washers—and has sold them in three territories—East, West, and Central—for the previous three years—2016, 2017, and 2018. In a relational database, these sales data would resemble Figure 10.5a-c. In a multidimensional database, in contrast, these data would be represented by a three-dimensional matrix (or data cube), as depicted in Figure 10.6. This matrix represents sales *dimensioned by* products and regions and year. Notice that Figure 10.5a presents only sales for 2016. Sales for 2017 and 2018 are presented in Figure 10.5b and c, respectively. Figure 10.7a-c illustrates the equivalence between these relational and multidimensional databases.

(a) 2016			(b) 2017			(c) 2018		
Product	Region	Sales	Product	Region	Sales	Product	Region	Sales
Nuts	East	50	Nuts	East	60	Nuts	East	70
Nuts	West	60	Nuts	West	70	Nuts	West	80
Nuts	Central	100	Nuts	Central	110	Nuts	Central	120
Screws	East	40	Screws	East	50	Screws	East	60
Screws	West	70	Screws	West	80	Screws	West	90
Screws	Central	80	Screws	Central	90	Screws	Central	100
Bolts	East	90	Bolts	East	100	Bolts	East	110
Bolts	West	120	Bolts	West	130	Bolts	West	140
Bolts	Central	140	Bolts	Central	150	Bolts	Central	160
Washers	East	20	Washers	East	30	Washers	East	40
Washers	West	10	Washers	West	20	Washers	West	30
Washers	Central	30	Washers	Central	40	Washers	Central	50

FIGURE 10.5 Relational

databases
FIGURE 10.6 Data



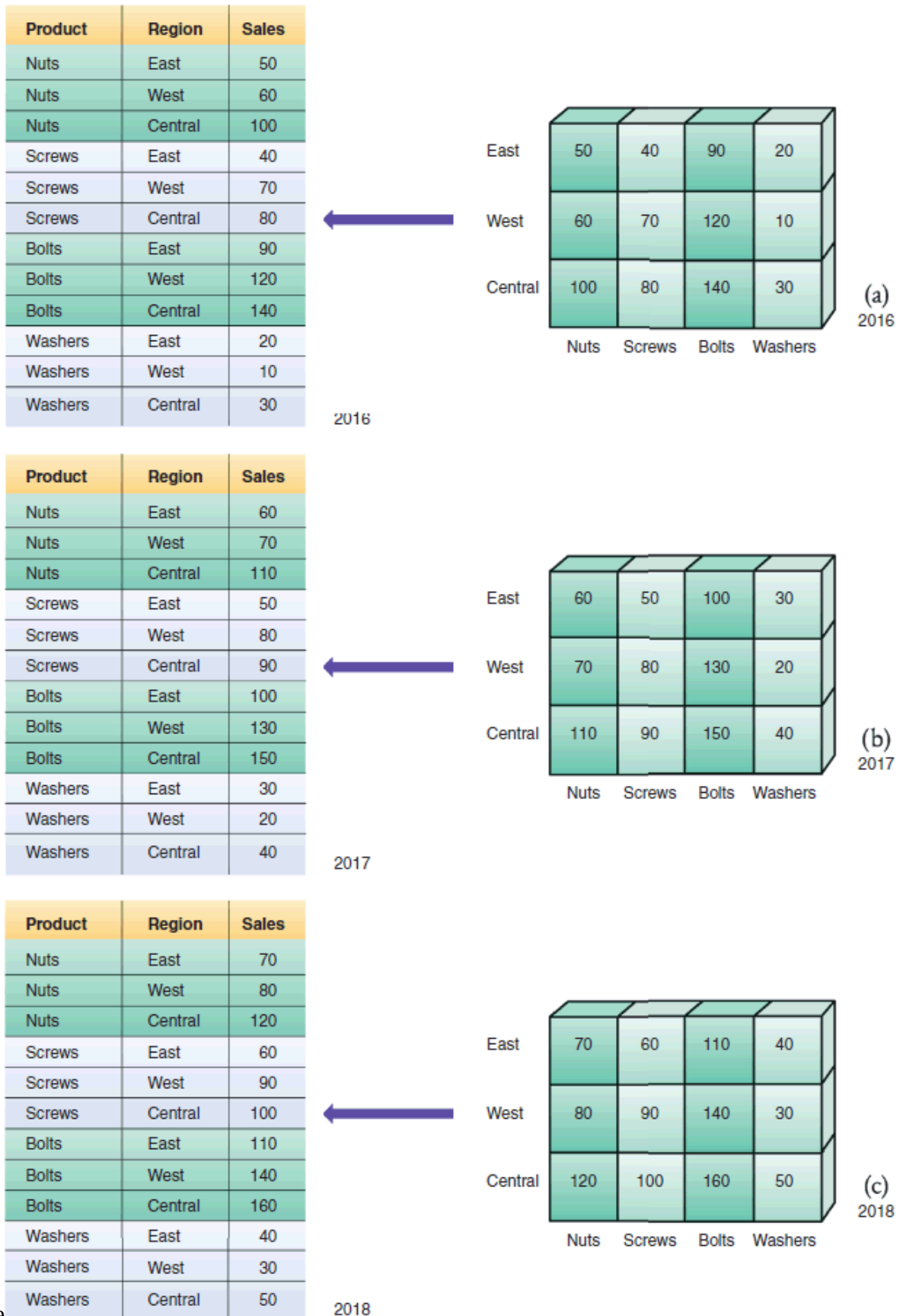


FIGURE 10.7 Equivalence between relational and multidimensional databases

Unfortunately, many source systems that have been in use for years contain “bad data” (e.g., missing or incorrect data) and are poorly documented. As a result, data-profiling software should be used at the beginning of a warehousing project to better understand the data. For example, this software can provide statistics on missing data, identify possible primary and foreign keys, and reveal how derived values (e.g., column 3 = column 1 + column 2) are calculated. Subject area database specialists (e.g., marketing, human resources) can also assist in understanding and accessing the data in source systems.

Organizations need to address other source systems issues as well. Often there are multiple systems that contain some of the same data and the best system must be selected as the source system. Organizations must also decide how granular (i.e., detailed) the data should be. For example, does the organization need daily sales figures or data at the individual transaction level? The conventional wisdom is that it is best to store data at a highly granular level because someone will likely request the data at some point.

Data Integration

In addition to storing data in their source systems, organizations need to extract the data, transform them, and then load them into a data mart or warehouse. This process is often called ETL, although the term *data integration* is increasingly being used to reflect the growing number of ways that source system data can be handled. For example, in some cases, data are extracted, loaded into a mart or warehouse, and then transformed (i.e., ELT rather than ETL).

Data extraction can be performed either by handwritten code (e.g., SQL queries) or by commercial data-integration software. Most companies employ commercial software. This software makes it relatively easy to specify the tables and attributes in the source systems that are to be used, map and schedule the movement of the data to the target (e.g., a data mart or warehouse), make the required transformations, and ultimately load the data.

After the data are extracted they are transformed to make them more useful. For example, data from different systems may be integrated around a common key, such as a customer identification number. Organizations adopt this approach to create a 360° view of all of their interactions with their customers. As an example of this process, consider a bank. Customers can engage in a variety of interactions: visiting a branch, banking online, using an ATM, obtaining a car loan, and more. The systems for these touch points—defined as the numerous ways that organizations interact with customers, such as email, the Web, direct contact, and the telephone—are typically independent of one another. To obtain a holistic picture of how customers are using the bank, the bank must integrate the data from the various source systems into a data mart or warehouse.

Other kinds of transformations also take place. For example, format changes to the data may be required, such as using *male* and *female* to denote gender, as opposed to 0 and 1 or M and F. Aggregations may be performed, say on sales figures, so that queries can use the summaries rather than recalculating them each time. Data-cleansing software may be used to “clean up” the data; for example, eliminating duplicate records for the same customer.

Finally, data are loaded into the warehouse or mart during a specific period known as the “load window.” This window is becoming smaller as companies seek to store ever-fresher data in their warehouses. For this reason, many companies have moved to real-time data warehousing where data are moved (using data-integration processes) from source systems to the data warehouse or mart almost instantly. For example, within 15 minutes of a purchase at Walmart, the details of the sale have been loaded into a warehouse and are available for analysis.

Storing the Data

A variety of architectures can be used to store decision-support data. The most common architecture is *one central enterprise data warehouse*, without data marts. Most organizations

use this approach, because the data stored in the warehouse are accessed by all users and represent the *single version of the truth*.

Another architecture is *independent data marts*. This architecture stores data for a single application or a few applications, such as marketing and finance. Limited thought is given to how the data might be used for other applications or by other functional areas in the organization. This is a very application-centric approach to storing data.

The independent data mart architecture is not particularly effective. Although it may meet a specific organizational need, it does not reflect an enterprise-wide approach to data management. Instead, the various organizational units create independent data marts. Not only are these marts expensive to build and maintain, but they often contain inconsistent data. For example, they may have inconsistent data definitions such as: What is a customer? Is a particular individual a potential or current customer? They might also use different source systems (which may have different data for the same item, such as a customer address). Although independent data marts are an organizational reality, larger companies have increasingly moved to data warehouses.

Still another data warehouse architecture is the *hub and spoke*. This architecture contains a central data warehouse that stores the data plus multiple dependent data marts that source their data from the central repository. Because the marts obtain their data from the central repository, the data in these marts still compose the *single version of the truth* for decision-support purposes.

The dependent data marts store the data in a format that is appropriate for how the data will be used and for providing faster response times to queries and applications. As you have learned, users can view and analyze data from the perspective of business dimensions and measures. This analysis is intuitive because the dimensions are in business terms, easily understood by users.

Metadata

It is important to maintain data about the data, known as *metadata*, in the data warehouse. Both the IT personnel who operate and manage the data warehouse and the users who access the data need metadata. IT personnel need information about data sources; database, table, and column names; refresh schedules; and data-usage measures. Users' needs include data definitions, report/query tools, report distribution information, and contact information for the help desk.

Data Quality

The quality of the data in the warehouse must meet users' needs. If it does not, users will not trust the data and ultimately will not use it. Most organizations find that the quality of the data in source systems is poor and must be improved before the data can be used in the data warehouse. Some of the data can be improved with data-cleansing software, but the better, long-term solution is to improve the quality at the source system level. This approach requires the business owners of the data to assume responsibility for making any necessary changes to implement this solution.

To illustrate this point, consider the case of a large Canadian hotel chain that wanted to conduct targeted marketing promotions using Canadian postal code data it collected from its guests when they checked in. When the company analyzed the postal code data, it discovered that many of the postal codes were entered as Z1Z 1Z1, which doesn't exist. How did this error occur? The answer is that the clerks were not asking customers for their postal codes, but they needed to enter something to complete the registration process. A short-term solution to this problem was to conduct the marketing campaign using city and province data instead of postal codes. The long-term solution was to make certain the clerks entered the actual postal codes. The latter solution required the hotel managers to take the responsibility for making certain their clerks enter the correct data.

Governance

To ensure that BI is meeting their needs, organizations must implement *governance* to plan and control their BI activities. Governance requires that people, committees, and processes be in place. Companies that are effective in BI governance often create a senior-level committee composed of vice presidents and directors who (1) ensure that the business strategies and BI strategies are aligned, (2) prioritize projects, and (3) allocate resources. These companies also establish a middle management-level committee that oversees the various projects in the BI portfolio to ensure that these projects are being completed according to the company's objectives. Finally, lower-level operational committees perform tasks such as creating data definitions and identifying and solving data problems. All of these committees rely on the collaboration and contributions of business users and IT personnel.

Users

Once the data are loaded in a data mart or warehouse, they can be accessed. At this point the organization begins to obtain business value from BI; all of the prior stages constitute creating BI infrastructure.

There are many potential BI users, including IT developers; frontline workers; analysts; information workers; managers and executives; and suppliers, customers, and regulators. Some of these users are *information producers* whose primary role is to create information for other users. IT developers and analysts typically fall into this category. Other users—including managers and executives—are *information consumers*, because they use information created by others.

Companies have reported hundreds of successful data-warehousing applications. You can read client success stories and case studies at the websites of vendors such as Teradata (www.teradata.com) and Oracle (www.oracle.com). For a more detailed discussion, visit The Data Warehousing Institute (<http://tdwi.org>). The benefits of data warehousing include the following:

- End users can access needed data quickly and easily via web browsers because these data are located in one place.
- End users can conduct extensive analysis with data in ways that were not previously possible.
- End users can obtain a consolidated view of organizational data.

These benefits can improve business knowledge, provide competitive advantage, enhance customer service and satisfaction, facilitate decision making, and streamline business processes. IT's About Business [10.3](#) demonstrates the benefits of data warehousing to the Nordea Bank in Scandinavia.

IT's About Business 10.3

Data Warehouse Gives Nordea Bank a Single Version of the Truth

MIS FIN Financial institutions across Europe must comply with demanding legislation and regulations created by various authorities around the globe in response to the worldwide financial crisis of 2008. These regulations require banks to report how much capital they hold and to document how they report risk. As a result, financial institutions are improving their data-management practices.

In Europe, these regulations include Basel III, which affects capital ratios; the European Central Bank, which is demanding faster and more detailed reporting with MFI 3; and the European Banking Authority, which is developing new financial reporting with Finrep.

The new regulations, along with ongoing business challenges, made data vitally important at Nordea Bank AB (www.nordea.com). As a result, the bank implemented a data warehouse.

Nordea, which is headquartered in Stockholm, Sweden, advertises itself as “the largest financial services group in Northern Europe.” Although Nordea has existed for a long time, the modern institution was formed in 2001 when major banks in Norway, Sweden, Denmark, and Finland merged their resources and operations. Today Nordea has more than 1,400 branches that conduct business in 19 countries. Its clientele includes 10 million private customers and 600,000 corporate clients. The group also operates an Internet bank, which services 6 million online customers.

Nordea's finance group agreed to lead a data warehouse project with a budget of €100 million. The project was managed not by the IT department but by the finance group because that group “owned” the data and the data-management processes. The project had two overriding objectives: to improve customer service and to comply with all relevant regulations.

As noted, Nordea was created from the merger of separate financial institutions from four countries, each with its own legacy information systems. (A legacy system is an outdated information system or application software that is used instead of available upgraded versions.) Data at Nordea were handled manually, stored on spreadsheets, and managed locally. This arrangement couldn't meet the demands of today's global banking system.

Because of these data-management problems, Nordea's top priority for the data warehouse project was to create a single version of the truth. Consequently, the finance team agreed on common data definitions and created the master data necessary to compare variables across locations and business functions. The data warehouse contains 11 terabytes of data, including more than 7 billion records.

Nordea deployed the data warehouse, based in Stockholm, with impressive results. Reporting lead times fell from eight to four days. The bank can now conduct analyses more quickly and accurately at lower costs, using data from one coherent source. Managers in the branches and in headquarters, along with the financial controllers, now receive the branch results in the same format, at the same time. They can drill down to the customer, account, and product data.

Nordea's customer relationship managers also benefit from the data warehouse. The organization introduced a customer profitability application so that customer relationship managers can more easily prepare for customer meetings because they do not have to obtain customer data from various databases.

The data warehouse enabled Nordea to meet the current regulatory requirements more quickly, accurately, and cheaply. Because of the reduced costs of compliance, the bank can reallocate capital to address needs in other areas of the business.

Nordea continues to thrive. In the third quarter of 2014, the bank's customer base grew and it had more than €250 billion in total assets under management. Finally, the bank's loan loss level is below its 10-year average.

Sources: Compiled from “EBA Stress Test Confirms Nordea's Strong Position,” *Nordea news release*, October 26, 2014; “Nordea Builds on a Financial Data Warehouse,” *TechandFinance.com*, October 27, 2013; R. Nielsen, “Nordea's ‘One Platform:’ Business Value with a Financial Data Warehouse,” *Teradata Conference and Expo*, October 2013; L. Clark, “European Banks Pull Data Together for Business and Legal Compliance,” *Computer Weekly Europe*, September 2013; L. Clark, “European Banks Raise Data Management Game in Response to New Regulations,” *Computer Weekly Europe*, September 2013; P. Swabey, “Nordea Prepares for Wave of Regulation with New Data Warehouse,” *Information Age*, April 15, 2013; www.nordea.com, accessed February 27, 2015.

Questions

1.

What are other advantages (not mentioned in the case) that Nordea might realize from its data warehouse?

2.

What recommendations would you give to Nordea Bank about incorporating Big Data into its data management? Provide specific examples of what types of Big Data you think Nordea should consider.

Despite their many benefits, data warehouses have some limitations. First, they can be very expensive to build and to maintain. Second, incorporating data from obsolete mainframe systems can be difficult and expensive. Finally, people in one department might be reluctant to share data with other departments.

As we have noted throughout this text, data and information are critically important organizational assets. Knowledge is a vital asset as well. Successful managers have always valued and utilized intellectual assets. These efforts were not systematic, however, and they did not ensure that knowledge was shared and dispersed in a way that benefited the overall organization. Moreover, industry analysts estimate that most of a company's knowledge assets are not housed in relational databases. Instead, they are dispersed in emails, word processing documents, spreadsheets, presentations on individual computers, and people's heads. This arrangement makes it extremely difficult for companies to access and integrate this knowledge. The result frequently is less-effective decision making.

Concepts and Definitions

Knowledge management (KM) is a process that helps organizations manipulate important knowledge that makes up part of the organization's memory, usually in an unstructured format. For an organization to be successful, knowledge, as a form of capital, must exist in a format that can be exchanged among persons. In addition, it must be able to grow.

Knowledge

In the information technology context, knowledge is distinct from data and information. As you learned in Chapter 1, data are a collection of facts, measurements, and statistics; information is organized or processed data that are timely and accurate. Knowledge is information that is *contextual*, *relevant*, and *useful*. Simply put, knowledge is information in action. Intellectual capital (or intellectual assets) is another term for knowledge.

To illustrate, a bulletin listing all of the courses offered by your university during one semester would be considered data. When you register, you process the data from the bulletin to create your schedule for the semester. Your schedule would be considered information. Awareness of your work schedule, your major, your desired social schedule, and characteristics of different faculty members could be construed as knowledge, because it can affect the way you build your schedule. You see that this awareness is contextual and relevant (to developing an optimal schedule of classes) as well as useful (it can lead to changes in your schedule). The implication is that knowledge has strong experiential and reflective elements that distinguish it from information in a given context. Unlike information, knowledge can be used to solve a problem.

Numerous theories and models classify different types of knowledge. Here you will focus on the distinction between explicit knowledge and tacit knowledge.

Explicit and Tacit Knowledge

Explicit knowledge deals with more objective, rational, and technical knowledge. In an organization, explicit knowledge consists of the policies, procedural guides, reports, products, strategies, goals, core competencies, and IT infrastructure of the enterprise. In other words, explicit knowledge is the knowledge that has been codified (documented) in a form that can be distributed to others or transformed into a process or a strategy. A description of how to process a job application that is documented in a firm's human resources policy manual is an example of explicit knowledge.

In contrast, tacit knowledge is the cumulative store of subjective or experiential learning. In an organization, tacit knowledge consists of an organization's experiences, insights, expertise, know-how, trade secrets, skill sets, understanding, and learning. It also includes the organizational culture, which reflects the past and present experiences of the organization's people and processes, as well as the organization's prevailing values. Tacit knowledge is generally imprecise and costly to transfer. It is also highly personal. Finally, because it is unstructured, it is difficult to formalize or codify, in contrast to explicit knowledge. A salesperson who has worked with particular customers over time and has come to know their needs quite well would possess extensive tacit knowledge. This knowledge is typically not recorded. In fact, it might be difficult for the salesperson to put into writing, even if he or she were willing to share it.

Knowledge Management Systems

The goal of knowledge management is to help an organization make the most productive use of the knowledge it has accumulated. Historically, management information systems have focused on capturing, storing, managing, and reporting explicit knowledge. Organizations now realize they need to integrate explicit and tacit knowledge into formal information systems. Knowledge management systems (KMSs) involve the use of modern information technologies—the Internet, intranets, extranets, databases—to systematize, enhance, and expedite intrafirm and interfirm knowledge management. KMSs are intended to help an organization cope with turnover, rapid change, and downsizing by making the expertise of the organization's human capital widely accessible. IT's About Business [10.4](#) describes how Braintree, part of eBay's group of companies, implemented a new knowledge management system.

IT's About Business10.4

Knowledge Management at Braintree

Braintree (www.braintreepayments.com) is a global payments platform that provides online and mobile payment processing services to online global companies such as accommodation service Airbnb (www.airbnb.com) and restaurant booking company Open Table Inc. (www.opentable.com). The company was recently bought by PayPal (www.paypal.com) and it is now part of the eBay group of companies.

With more people doing transactions through devices such as smart phones and tablets, the online and mobile payments industry is undergoing very rapid growth, putting increasing pressure on Braintree, including its approach to knowledge management.

Until recently, employees at Braintree used different ways to access company documents and information. For example, a new employee wanting to know about HR policies, or an existing employee wanting to solve a customer problem, would have to look through numerous

wikis, Google Docs, and white boards, and sift through information that was redundant, conflicting, or irrelevant. Document management became critical. Braintree adopted knowledge management system Confluence (<https://confluence.atlassian.com>).

Confluence's Knowledge Base allows organizations to create and distribute structured how-to and troubleshooting documents that are automatically organized and easy to find. Employees have a sense of ownership of the information because they are the main contributors to knowledge. Within two years, the percentage of employees who said they regularly used Confluence grew tenfold, to nearly 95 percent. As Confluence and the knowledge-sharing culture gains traction at Braintree, the organization is adding more staff and policies to guide it.

Sources: Compiled from “*Braintree Creates a Knowledge-Sharing Culture with Confluence*,” Atlassian customer story, www.atlassian.com, accessed February 9, 2016; Braintree website, www.braintreepayments.com, accessed February 9, 2016; Atlassian website, www.atlassian.com, accessed February 9, 2016.

Questions

1.
Using the example of Braintree and the steps of the knowledge management cycle, explain how a knowledge management system could help employees.
2.
Why is a knowledge-sharing culture so important for the success of a knowledge management system?
3.
What role does a knowledge management system play with regard to tacit knowledge? Use the example of Braintree in your answer.
As we saw in the case of Braintree, organizations can realize many benefits with KMSs. Most importantly, they make [best practices](#)—the most effective and efficient ways of doing things—readily available to a wide range of employees. Enhanced access to best-practice knowledge improves overall organizational performance. For example, account managers can now make available their tacit knowledge about how best to manage large accounts. The organization can then use this knowledge when it trains new account managers. Other benefits include improved customer service, more efficient product development, and improved employee morale and retention.

At the same time, however, implementing effective KMSs presents several challenges. First, employees must be willing to share their personal tacit knowledge. To encourage this behaviour, organizations must create a knowledge management culture that rewards employees who add their expertise to the knowledge base. Second, the organization must continually maintain and upgrade its knowledge base. Specifically, it must incorporate new knowledge and delete old, outdated knowledge. Finally, companies must be willing to invest in the resources needed to carry out these operations.

The KMS Cycle

A functioning KMS follows a cycle that consists of six steps (see Figure [10.8](#)). The reason the system is cyclical is that knowledge is dynamically refined over time. The knowledge in an effective KMS is never finalized because the environment changes over time and knowledge must be updated to reflect these changes. The cycle works as follows:

- **1.Create knowledge:** Knowledge is created as people determine new ways of doing things or develop know-how. Sometimes external knowledge is brought in.

- **2.Capture knowledge:** New knowledge must be identified as valuable and be represented in a reasonable way.
- **3.Refine knowledge:** New knowledge must be placed in context so that it is actionable. This is where tacit qualities (human insights) must be captured along with explicit facts.
- **4.Store knowledge:** Useful knowledge must then be stored in a reasonable format in a knowledge repository so that other people in the organization can access it.
- **5.Manage knowledge:** Like a library, the knowledge must be kept current. It must be reviewed regularly to verify that it is relevant and accurate.
- **6.Disseminate knowledge:** Knowledge must be made available in a useful format to anyone in the organization who needs it, anywhere and anytime.

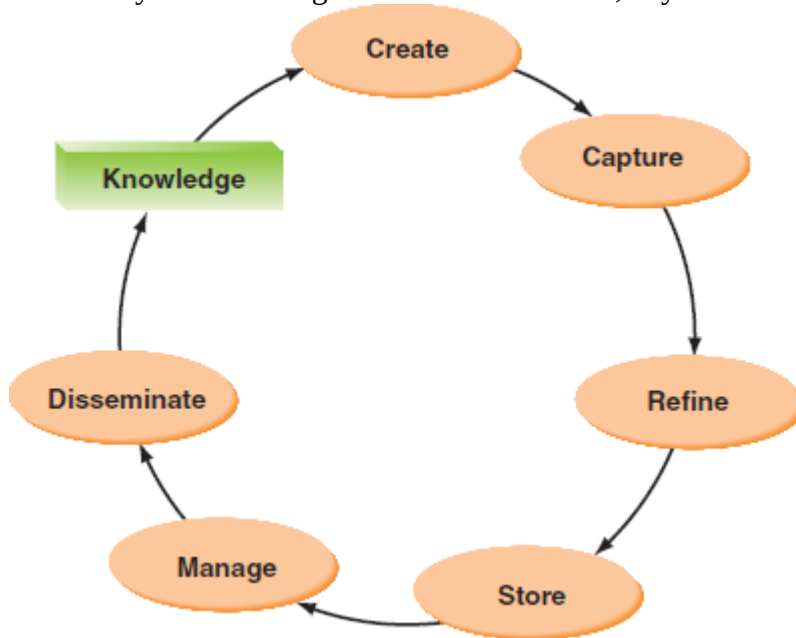


FIGURE 10.8 The knowledge

management system cycle

There are many operations possible with relational databases. In this Appendix, we discuss three of these operations: query languages, normalization, and joins.

As you saw in this chapter, a relational database is a collection of interrelated two-dimensional tables, consisting of rows and columns. Each row represents a record, and each column (or field) represents an attribute (or characteristic) of that record. Every record in the database must contain at least one field that uniquely identifies that record so that it can be retrieved, updated, and sorted. This identifier field, or group of fields, is called the *primary key*. In some cases, locating a particular record requires the use of secondary keys. A *secondary key* is another field that has some identifying information, but typically does not uniquely identify the record. A *foreign key* is a field (or group of fields) in one table that matches the primary key value in a row of another table. A foreign key is used to establish and enforce a link between two tables.

These related tables can be joined when they contain common columns. The uniqueness of the primary key tells the DBMS which records are joined with others in related tables. This feature allows users great flexibility in the variety of queries they can make. Despite these features, however, the relational database model has some disadvantages. Because large-scale databases can be composed of many interrelated tables, the overall design can be complex, leading to slow search and access times.

Query Languages

The most commonly performed database operation is searching for information. [Structured query language \(SQL\)](#) is the most popular query language used for interacting with a database. SQL allows people to perform complicated searches by using relatively simple statements or key words. Typical key words are SELECT (to choose a desired attribute), FROM (to specify the table or tables to be used), and WHERE (to specify conditions to apply in the query).

To understand how SQL works, imagine that a university wants to know the names of students who will graduate with a GPA of between 3.40 and 3.60 in May 2018. (Refer to Figure 10.3.) The university IT staff would query the student relational database with an SQL statement such as

- SELECT Student_Name
- FROM Student_Database
- WHERE GPA >= 3.40 and
- GPA < 3.60

The SQL query would return John Jones and Juan Rodriguez.

Another way to find information in a database is to use [query by example \(QBE\)](#). In QBE, the user fills out a grid or template—also known as a *form*—to construct a sample or a description of the data desired. Users can construct a query quickly and easily by using drag-and-drop features in a DBMS such as Microsoft Access. Conducting queries in this manner is simpler than keying in SQL commands.

Entity-Relationship Modelling



Video Lesson: Entity-Relationship Modeling

[Video Lesson: Entity-Relationship Modeling](#)

Designers plan and create databases through the process of [entity-relationship \(ER\) modelling](#), using an [entity-relationship \(ER\) diagram](#). There are many approaches to ER diagramming. You will see one particular approach here, but there are others. The good news is that if you are familiar with one version of ER diagramming, then you will be able to easily adapt to any other version.

ER diagrams consist of entities, attributes, and relationships. To properly identify entities, attributes, and relationships, database designers first identify the business rules for the particular data model. [Business rules](#) are precise descriptions of policies, procedures, or principles in any organization that stores and uses data to generate information. Business rules are derived from a description of an organization's operations, and help create and enforce business processes in that organization. Keep in mind that *you* determine these business rules, not the MIS department.

Entities are pictured in rectangles, and relationships are described on the line between two entities. The attributes for each entity are listed, and the primary key is underlined. The [data dictionary](#) provides information on each attribute, such as its name, if it is a key, part of a key, or a non-key attribute, the type of data expected (alphanumeric, numeric, dates, etc.), and valid values. Data dictionaries can also provide information on why the attribute is needed in the database; which business functions, applications, forms, and reports use the attribute; and how often the attribute should be updated.

ER modelling is valuable because it allows database designers to communicate with users throughout the organization to ensure that all entities and the relationships among the entities are represented. This process underscores the importance of taking all users into account when

designing organizational databases. Notice that all entities and relationships in our example are labelled in terms that users can understand.

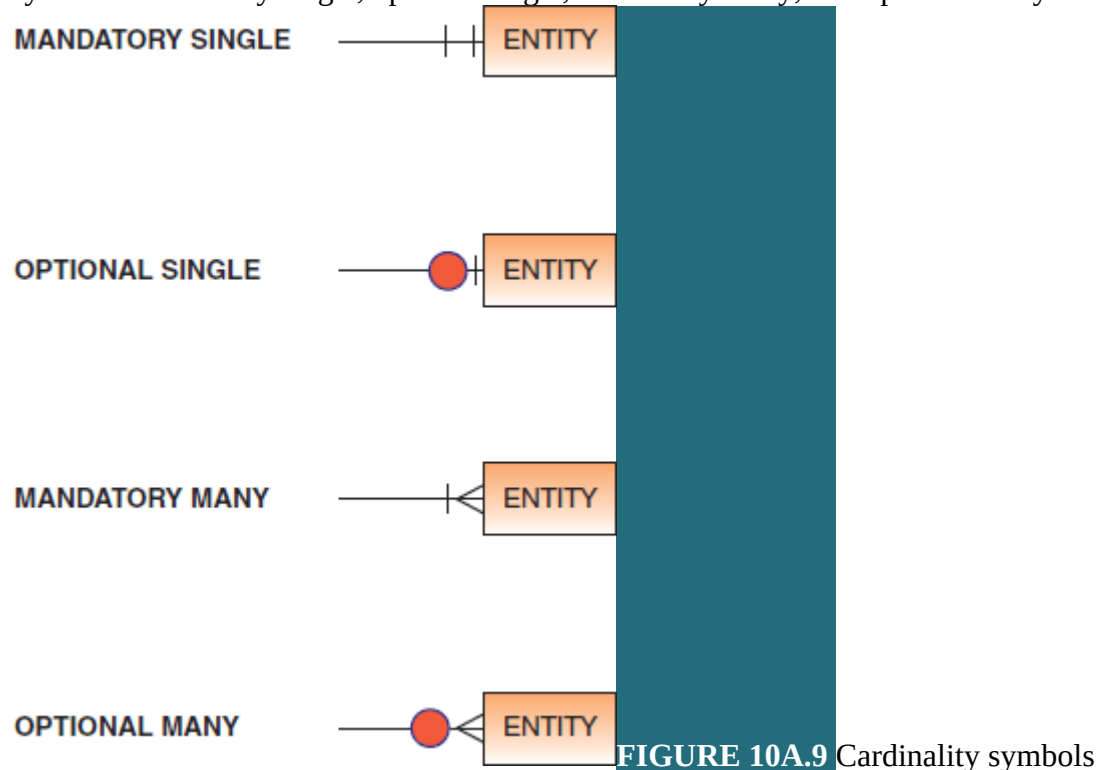
[Relationships](#) illustrate an association between entities. The *degree of a relationship* indicates the number of entities associated with a relationship. A [unary relationship](#) exists when an association is maintained within a single entity. A [binary relationship](#) exists when two entities are associated. A [ternary relationship](#) exists when three entities are associated. In this Appendix, we discuss only binary relationships because they are the most common. Entity relationships may be classified as one-to-one, one-to-many, or many-to-many. The term [connectivity](#) describes the relationship classification.



Video Lesson: Entity-Relationship Modeling: Cardinality and Modality

Video Lesson: Entity-Relationship Modeling: Cardinality and Modality

Connectivity and cardinality are established by the business rules of a relationship. [Cardinality](#) is the maximum number of times an instance of one entity can be associated with an instance in the related entity. Cardinality can be mandatory single, optional single, mandatory many, or optional many. Figure 10A.9 displays the cardinality symbols. Note that we have four possible cardinality symbols: mandatory single, optional single, mandatory many, and optional many.



Let's look at an example from a university. An *entity* is a person, place, or thing that can be identified in the users' work environment. For example, consider student registration at a university. Students register for courses, and they also register their cars for parking permits. In this example, STUDENT, PARKING PERMIT, CLASS, and PROFESSOR are entities. Recall that an instance of an entity represents a particular student, parking permit, class, or professor. Therefore, a particular STUDENT (James Smythe, 8023445) is an instance of the STUDENT entity; a particular parking permit (91778) is an instance of the PARKING PERMIT entity; a particular class (76890) is an instance of the CLASS entity; and a particular professor (Margaret Wilson, 390567) is an instance of the PROFESSOR entity.

Entity instances have *identifiers*, or *primary keys*, which are attributes (attributes and identifiers are synonymous) that are unique to that entity instance. For example, STUDENT instances can be identified with Student Identification Number; PARKING PERMIT instances can be identified with Permit Number; CLASS instances can be identified with Class Number; and PROFESSOR instances can be identified with Professor Identification Number.

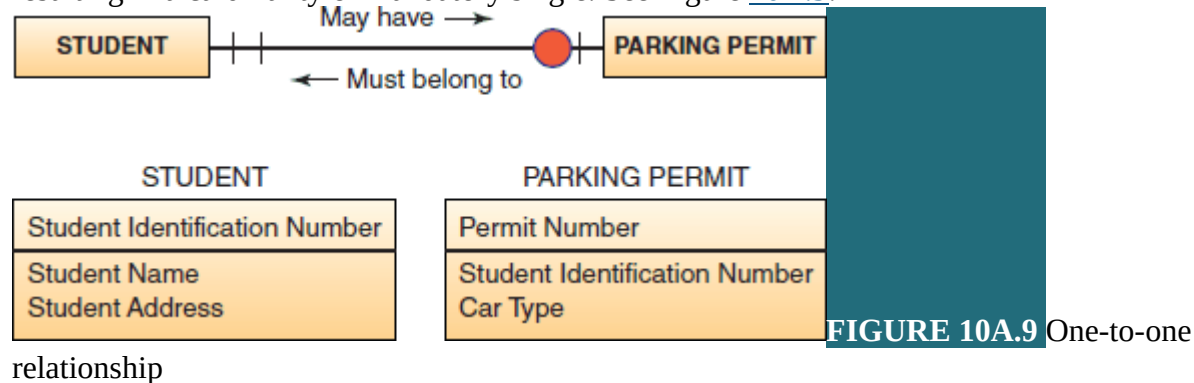
Entities have attributes, or properties, that describe the entity's characteristics. In our example, examples of attributes for STUDENT are Student Name and Student Address. Examples of attributes for PARKING PERMIT are Student Identification Number and Car Type. Examples of attributes for CLASS are Class Name, Class Time, and Class Place. Examples of attributes for PROFESSOR are Professor Name and Professor Department. (Note that each course at this university has one professor—no team teaching.)

Why is Student Identification Number an attribute of both the STUDENT and PARKING PERMIT entity classes? That is, why do we need the PARKING PERMIT entity class? If you consider all of the interlinked university systems, the PARKING PERMIT entity class is needed for other applications, such as fee payments, parking tickets, and external links to the vehicles registry of the Ministry of Transportation in your province.

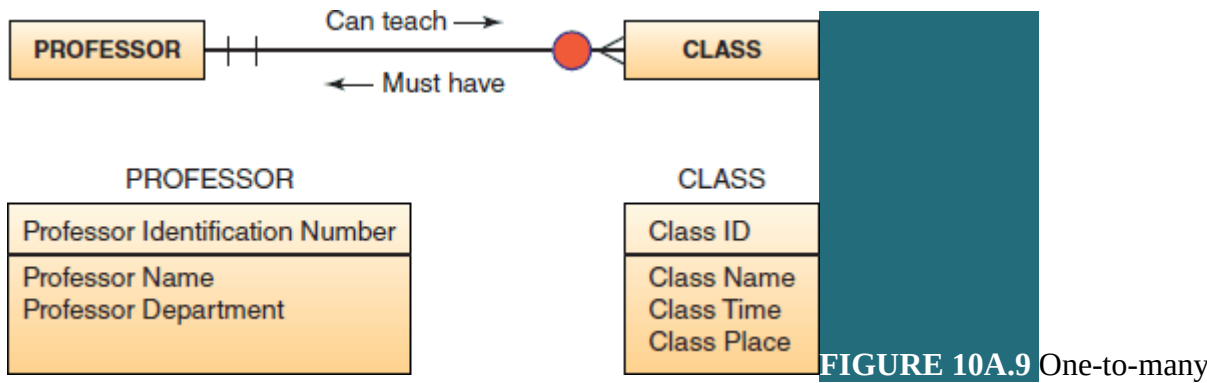
Let's consider the three types of binary relationships in our example.

In a *one-to-one (1:1)* relationship, a single-entity instance of one type is related to a single-entity instance of another type. In our university example, STUDENT-PARKING PERMIT is a 1:1 relationship. The business rule at this university represented by this relationship is: Students may register only one car at this university. Of course, students do not have to register a car at all. That is, a student can have only one parking permit but does not need to have one.

Note that the relationship line on the PARKING PERMIT side shows a cardinality of optional single. A student can have, but does not need to have, a parking permit. On the STUDENT side of the relationship, only one parking permit can be assigned to one student, resulting in a cardinality of mandatory single. See Figure 10A.9.



The second type of relationship, *one-to-many (1:M)*, is represented by the CLASS-PROFESSOR relationship in Figure 10A.9. The business rule at this university represented by this relationship is: At this university, there is no team teaching. Therefore, each class must have only one professor. On the other hand, professors may teach more than one class. Note that the relationship line on the PROFESSOR side shows a cardinality of mandatory single. In contrast, the relationship line on the CLASS side shows a cardinality of optional many.



relationship

The third type of relationship, *many-to-many (M:M)*, is represented by the STUDENT-CLASS relationship. Most database management systems do not support many-to-many relationships. Therefore, we use *junction* (or *bridge*) tables, so that we have two one-to-many relationships. The business rule at this university represented by this relationship is: Students can register for one or more classes, and each class can have one or more students (see Figure 10A.9).

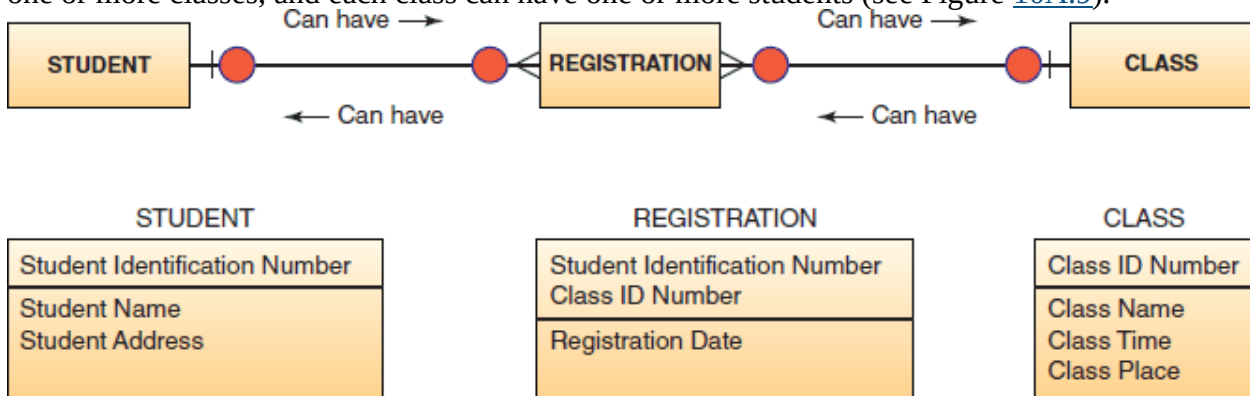


FIGURE 10A.9 Many-to-many relationship

In this example, we create the REGISTRATION table as our junction table. Note that Student ID and Class ID are foreign keys in the REGISTRATION table.

Let's examine the relationships:

- The relationship line on the STUDENT side of the STUDENT-REGISTRATION relationship shows a cardinality of optional single.
- The relationship line on the REGISTRATION side of the STUDENT-REGISTRATION relationship shows a cardinality of optional many.
- The relationship line on the CLASS side of the CLASS-REGISTRATION relationship shows a cardinality of optional single.
- The relationship line on the REGISTRATION side of the CLASS-REGISTRATION relationship shows a cardinality of optional many.

Normalization and Joins



Video Lesson: Normalization and Joins

To use a relational database management system efficiently and effectively, the data must be analyzed to eliminate redundant data elements. [Normalization](#) is a method for analyzing and reducing a relational database to its most streamlined form to ensure minimum redundancy,

maximum data integrity, and optimal processing performance. Data normalization is a methodology for organizing attributes into tables so that redundancy among the non-key attributes is eliminated. The result of the data normalization process is a properly structured relational database.

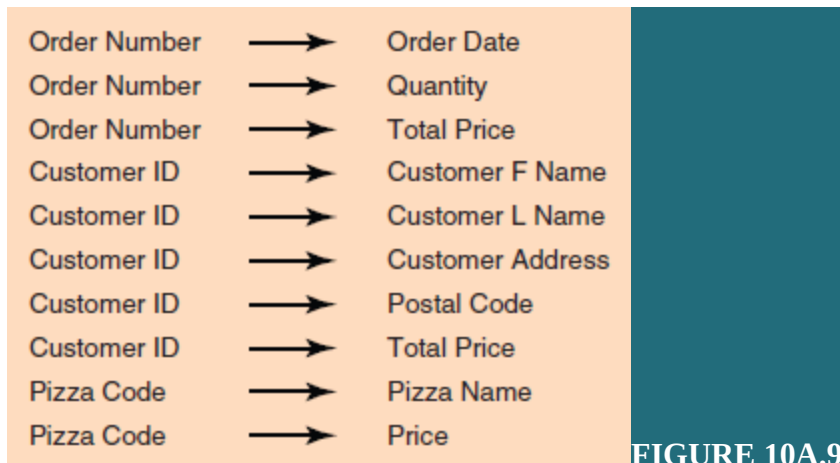
Data normalization requires a list of all the attributes that must be incorporated into the database and a list of all of the defining associations, or functional dependencies, among the attributes. [Functional dependencies](#) are a means of expressing that the value of one particular attribute is associated with a specific single value of another attribute. For example, for a Student Number 420-33-9834 at a university, there is exactly one Student Name, John Jones, associated with it (Figure [10.3](#)). That is, Student Number is referred to as the determinant because its value *determines* the value of the other attribute. We can also say that Student Name is functionally dependent on Student Number.

As an example of normalization, consider a pizza shop. This shop takes orders from customers on a form. Figure [10A.9](#) shows non-normalized data gathered by the pizza shop. This table has two records, one for each order being placed. Because there are several pizzas on each order, the order number and customer information appear in multiple rows. Several attributes of each record have null values. A null value is an attribute with no data in it. For example, Order Number has four null values. Therefore, this table is not in first normal form. The data drawn from that form is shown in Figure [10A.9](#).

ORDER NUMBER	ORDER DATE	CUSTOMER ID	CUSTOMER F NAME	CUSTOMER L NAME	CUSTOMER ADDRESS	POSTAL CODE	PIZZA CODE
1116	9/1/18	16421	Rob	Penny	123 Main St.	M4P 2Y3	P
							MF
							V
1117	9/2/18	17221	Beth	Sladowski	41 Oak St.	M3J 1P3	HM
							MF
							TH

FIGURE 10A.9 Raw data gathered from orders at the pizza shop

In our example, ORDER, CUSTOMER, and PIZZA are entities. The first step in normalization is to determine the functional dependencies among the attributes. The functional dependencies in our example are shown in Figure [10A.9](#).

**FIGURE 10A.9** Functional dependencies in

pizza shop example

In the normalization process, we will proceed from non-normalized data, to first normal form, to second normal form, and then to third normal form. (There are additional normal forms, but they are beyond the scope of this book.)

Figure 10A.9 demonstrates the data in *first normal form*. The attributes under consideration are listed in one table and primary keys have been established. Our primary keys are Order Number, Customer ID, and Pizza Code. In first normal form, each ORDER has to repeat the order number, order date, customer first name, customer last name, customer address, and customer postal code. This data file contains repeating groups and describes multiple entities. That is, this relation has data redundancy and a lack of data integrity, and the flat file would be difficult to use in various applications that the pizza shop might need.

ORDER NUMBER	ORDER DATE	CUSTOMER ID	CUSTOMER F NAME	CUSTOMER L NAME	CUSTOMER ADDRESS	POSTAL CODE	PIZZA CODE
1116	9/1/18	16421	Rob	Penny	123 Main St.	M4P 2Y3	P
1116	9/1/18	16421	Rob	Penny	123 Main St.	M4P 2Y3	MF
1116	9/1/18	16421	Rob	Penny	123 Main St.	M4P 2Y3	V
1117	9/2/18	17221	Beth	Sladowski	41 Oak St.	M3J 1P3	HM
1117	9/2/18	17221	Beth	Sladowski	41 Oak St.	M3J 1P3	MF
1117	9/2/18	17221	Beth	Sladowski	41 Oak St.	M3J 1P3	TH

FIGURE 10A.9 First normal form for data from pizza shop

Consider Figure 10A.9, and notice the very first column (labelled Order Number). This column contains multiple entries for each order—three rows for Order Number 1116 and three rows for Order Number 1117. These multiple rows for an order are called *repeating groups*.

Figure 10A.9 also contains multiple entities: ORDER, CUSTOMER, and PIZZA. Therefore, we move on to second normal form.

To produce second normal form, we break Figure 10A.9 into smaller tables to eliminate some of its data redundancy. Second normal form does not allow partial functional dependencies. That is, in a table in second normal form, every non-key attribute must be functionally dependent on the entire primary key of that table. Figure 10A.9 shows the data from the pizza shop in second normal form.

ORDER NUMBER	ORDER DATE	CUSTOMER ID	CUSTOMER F NAME	CUSTOMER L NAME	CUSTOMER ADDRESS
1116	9/1/18	16421	Rob	Penny	123 Main
1116	9/1/18	16421	Rob	Penny	123 Main
1116	9/1/18	16421	Rob	Penny	123 Main
1117	9/2/18	17221	Beth	Sladowski	41 Oak St.
1117	9/2/18	17221	Beth	Sladowski	41 Oak St.
1117	9/2/18	17221	Beth	Sladowski	41 Oak St.

ORDER NUMBER	PIZZA CODE
1116	P
1116	MF
1116	V
1117	HM
1117	MF
1117	TH

PIZZA CODE	PIZZA NAME
P	Pepperoni
MF	Meat Feast
V	Vegetarian
HM	Ham and Mushroom
TH	The Hawaiian

FIGURE 10A.9 Second normal form for data from pizza shop

If you examine Figure 10A.9, you will see that second normal form has not eliminated all the data redundancy. For example, each Order Number is duplicated three times, as are all customer data. In *third normal form*, non-key attributes are not allowed to define other non-key attributes. That is, third normal form does not allow transitive dependencies in which one non-key attribute is functionally dependent on another. In our example, customer information depends both on Customer ID and Order Number. Figure 10A.9 shows the data from the pizza shop in third normal form. Third normal form structure has these important points:

- It is completely free of data redundancy.
- All foreign keys appear where needed to link related tables.

ORDER		
1116	9/1/18	16421

1117

9/2/18

17221

CUSTOMER

16421	Rob	Penny	123 Main St.
17221	Beth	Sladowski	41 Oak St.

ORDER-PIZZA

1116	P
1116	MF
1116	V
1117	HM
1117	MF
1117	TH

PIZZA

P	Pepperoni
MF	Meat Feast
V	Vegetarian
HM	Ham and Mushroom
TH	The Hawaiian

FIGURE 10A.9 Third normal form for data from pizza shop

Let's look at the primary and foreign keys for the tables in third normal form:

- The ORDER relation: The primary key is Order Number and the foreign key is Customer ID.
- The CUSTOMER relation: The primary key is Customer ID.
- The PIZZA relation: The primary key is Pizza Code.
- The ORDER-PIZZA relation: The primary key is a composite key, consisting of two foreign keys, Order Number and Pizza Code.

Now consider an order at the pizza shop. The tables in third normal form can produce the order in the following manner by using the join operation (see Figure 10A.9). The [join operation](#) combines records from two or more tables in a database to obtain information that is located in different tables. In our example, the join operation combines records from the four normalized tables to produce an ORDER. Here is how the join operation works:

- The ORDER relation provides the Order Number (the primary key), Order Date, and Total Price.

- The primary key of the ORDER relation (Order Number) provides a link to the ORDER-PIZZA relation (the link numbered 1 in Figure 10A.9).
- The ORDER-PIZZA relation supplies the Quantity to ORDER.
- The primary key of the ORDER-PIZZA relation is a composite key that consists of Order Number and Pizza Code. Therefore, the Pizza Code component of the primary key provides a link to the PIZZA relation (the link numbered 2 in Figure 10A.9).
- The PIZZA relation supplies the Pizza Name and Price to ORDER.
- The Customer ID in ORDER (a foreign key) provides a link to the CUSTOMER relation (the link numbered 3 in Figure 10A.9).
- The CUSTOMER relation supplies the Customer F Name, Customer L Name, Customer Address, and Postal Code to ORDER.

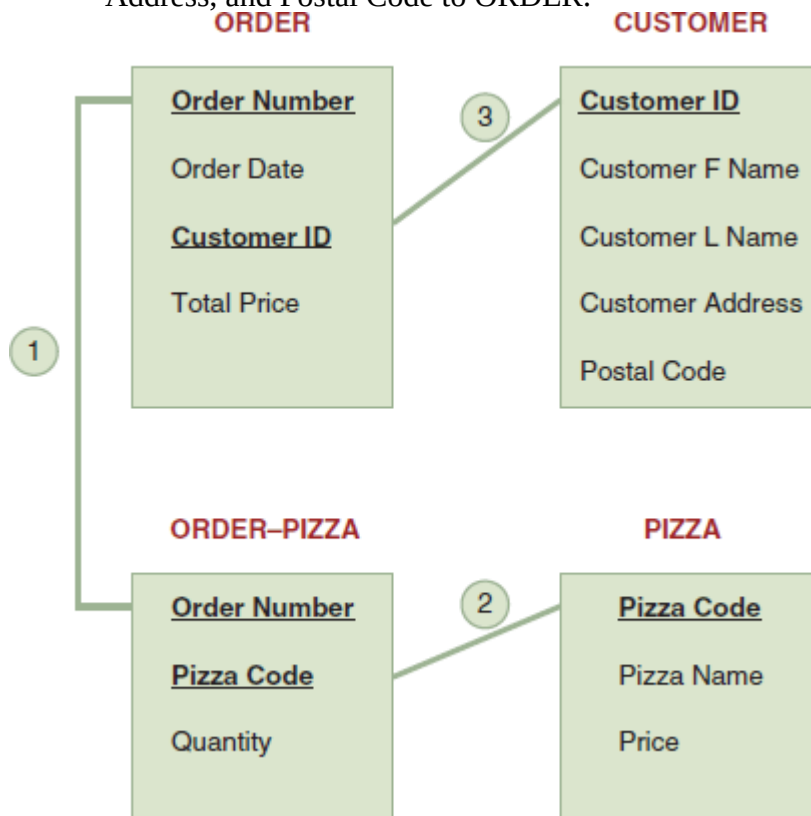


FIGURE 10A.9 The join process

with the tables of third normal form to produce an order

At the end of this join process, we have a complete ORDER. Normalization is beneficial when maintaining databases over a period of time. One example is the likelihood of having to change the price of each pizza. If the pizza shop increases the price of the Meat Feast from \$12.00 to \$12.50, this process is one easy step in Figure 10A.9. The price field is changed to \$12.50 and the ORDER is automatically updated with the current value of the price.

The accounting function is intimately concerned with keeping track of the transactions and internal controls of an organization. Modern databases enable accountants to perform these functions more effectively. Databases help accountants manage the flood of data in today's organizations so that they can keep their firms in compliance with standards imposed by financial reporting legislation.

Accountants also play a role in cost justifying the creation of a knowledge base and then auditing its cost-effectiveness. In addition, if you work for a large accounting company that

provides management services or sells knowledge, you will most likely use some of your company's best practices that are stored in a knowledge base.

FIN For the Finance Major

Financial managers make extensive use of computerized databases that are external to the organization, such as CompuStat or Toronto Stock Exchange (TSX), to obtain financial data on organizations in their industry. They can use these data to determine if their organization meets industry benchmarks in return on investment, cash management, and other financial ratios.

Financial managers also work very closely with databases in order to produce the organization's financial status reports and comply with financial reporting legislation.

MKT For the Marketing Major

Databases help marketing managers access data from the organization's marketing transactions, such as customer purchases, to plan targeted marketing campaigns and to evaluate the success of previous campaigns. Knowledge about customers can mean the difference between success and failure. In many databases and knowledge bases, the vast majority of information and knowledge concerns customers, products, sales, and marketing. Marketing managers regularly use an organization's knowledge base, and they often participate in its creation.

POM For the Production/Operations Management Major

Production/operations personnel access organizational data to determine optimum inventory levels for parts in a production process. Past production data enable production/operations management (POM) personnel to determine the optimum configuration for assembly lines. Firms also collect data that inform them not only about the quality of finished products but also about quality issues with incoming raw materials, production irregularities, shipping and logistics, and after-sale use and maintenance of the product.

Knowledge management is extremely important for running complex operations. The accumulated knowledge regarding scheduling, logistics, maintenance, and other functions is very valuable. Innovative ideas are necessary for improving operations and can be supported by knowledge management.

HRM For the Human Resource Management Major

Organizations keep extensive data on employees, including gender, age, race, current and past job descriptions, and performance evaluations. HR personnel access these data to provide reports to government agencies regarding compliance with federal employment equity guidelines. HR managers also use these data to evaluate hiring practices, evaluate salary structures, and manage any discrimination grievances or lawsuits brought against the firm.

Databases help HR managers provide assistance to all employees as companies turn over more and more decisions about health care and retirement planning to the employees themselves. The employees can use the databases for help in selecting the optimal mix among these critical choices.

Human resource managers also need to use a knowledge management system frequently to find out how past cases were handled. Consistency in how employees are treated not only is

important, but it also protects the company against legal actions. In addition, training for building, maintaining, and using the knowledge system sometimes is the responsibility of the HR department. Finally, the HR department might be responsible for compensating employees who contribute their knowledge to the knowledge base.

MIS For the MIS Major

The MIS function manages the organization's data as well as the databases. MIS database administrators standardize data names by using the data dictionary. This process ensures that all users understand which data are in the database. Database personnel also help users access needed data and generate reports with query tools.

For All Business Majors

All business majors will have to manage data in their professional work. One way to manage data is through the use of databases and database management systems. First, it is likely that you will need to obtain information from your organization's databases. You will probably use structured query language to obtain this information. Second, as your organization plans and designs its databases, it will most likely use entity-relationship diagrams. You will provide much of the input to these ER diagrams. For example, you will describe the entities that you use in your work, the attributes of those entities, and the relationships among them. You will also help database designers as they normalize database tables, by describing how the normalized tables relate to each other (e.g., through the use of primary and foreign keys). Finally, you will help database designers as they plan their join operations to give you the information that you need when that information is stored in multiple tables.

- **1.Discuss ways that common challenges in managing data can be addressed using data governance.**

The following are three common challenges in managing data:

- •Data are scattered throughout organizations and are collected by many individuals using various methods and devices. These data are frequently stored in numerous servers and locations and in different computing systems, databases, formats, and human and computer languages.
- •Data come from multiple sources.
- •Information systems that support particular business processes impose unique requirements on data, which results in repetition and conflicts across an organization.

One strategy for implementing data governance is master data management. Master data management provides companies with the ability to store, maintain, exchange, and synchronize a consistent, accurate, and timely “single version of the truth” for the company's core master data. Master data management manages data gathered from across an organization, manages data from multiple sources, and manages data across business processes in an organization.

- **2.Discuss the advantages and disadvantages of relational databases.**

Relational databases allow people to compare information quickly by row or column. In addition, items are easy to retrieve by finding the point of intersection of a particular row and column. On the other hand, large-scale relational databases can be composed of many interrelated tables, making the overall design complex with slow search and access times.

- **3.Define *Big Data* and discuss its basic characteristics.**

Big Data is a collection of data that is very large and complex. Big Data is composed of high-volume, high-velocity, and high-variety data assets that require new forms of processing to enable enhanced decision making, insight discovery, and process optimization. Big Data has three distinct characteristics—volume, velocity, and variety—that distinguish it from traditional data:

- •**Volume:** Big Data consists of vast quantities of data.
- •**Velocity:** Big Data flows into an organization at increasing speed.
- •**Variety:** Big Data includes a huge variety of different data in differing data formats.

● **4.Explain the elements necessary to successfully implement and maintain data warehouses.**

To successfully implement and maintain a data warehouse, an organization must do the following.

- •Link source systems that provide data to the warehouse or mart.
- •Prepare the necessary data for the data warehouse using data-integration technology and processes.
- •Decide on an appropriate architecture for storing data in the data warehouse or data mart.
- •Select the tools and applications for the variety of organizational users.
- •Ensure that metadata, data quality, and governance processes are in place to ensure that the data warehouse or mart meets its purposes.

● **5.Describe the benefits and challenges of implementing knowledge management systems in organizations.**

Organizations can realize many benefits with KMSs:

- •Best practices are readily available to a wide range of employees.
- •Customer service is improved.
- •Product development is more efficient.
- •Employee morale and retention are improved.

Challenges to implementing KMSs include the following:

- •Employees must be willing to share their personal tacit knowledge.
- •Organizations must create a knowledge management culture that rewards employees who add their expertise to the knowledge base.
- •The knowledge base must be continually maintained and updated.
- •Companies must be willing to invest in the resources needed to carry out these operations.

● **6.Understand the processes of querying a relational database, entity-relationship modelling, normalization, and joins.**

The most commonly performed database operation is requesting information. *Structured query language* is the most popular query language used for this operation. SQL allows people to perform complicated searches by using relatively simple statements or key words. Typical key words are SELECT (to specify a desired attribute), FROM (to specify the table to be used), and WHERE (to specify conditions to apply in the query).

Another way to find information in a database is to use *query by example*. In QBE, the user fills out a grid or template—also known as a *form*—to construct a sample or a description of the data desired. Users can construct a query quickly and easily by using drag-and-drop features in a DBMS such as Microsoft Access. Conducting queries in this manner is simpler than keying in SQL commands.

Designers plan and create databases through the process of entity-relationship modelling, using an entity-relationship diagram. ER diagrams consist of entities,

attributes, and relationships. Entities are pictured in boxes, and relationships are represented as diamonds. The attributes for each entity are listed, and the primary key is underlined.

ER modelling is valuable because it allows database designers to communicate with users throughout the organization to ensure that all entities and the relationships among the entities are represented. This process underscores the importance of taking all users into account when designing organizational databases. Notice that all entities and relationships in our example are labelled in terms that users can understand.

Normalization is a method for analyzing and reducing a relational database to its most streamlined form to ensure minimum redundancy, maximum data integrity, and optimal processing performance. When data are *normalized*, attributes in each table depend only on the primary key.

The *join operation* combines records from two or more tables in a database to produce information that is located in different tables.

When customers access a website and make purchases, they generate _____.

- ☐ Web data
- ☐ information
- ☒ clickstream data
- ☐ hyperlink data
- ☐ tracking cookies

Data redundancy refers to:

- ☐ storing data in a single central location.
- ☐ sharing data with others.
- ☒ having copies of the same data in multiple locations.
- ☐ All of these

In a relational database, the customer record contains information regarding the customer's last name. The last name is a(n):

- ☒ attribute
- ☐ entity
- ☐ object
- ☐ relation
- ☐ primary key

A _____ is a logical grouping of related fields.

- ☐ byte
- ☒ record
- ☐ field
- ☐ file
- ☐ database

In a database, the primary key field is used to _____.

- ☐ specify an entity
- ☐ create linked lists
- ☐ identify duplicated data
- ☒ uniquely identify a record
- ☐ uniquely identify an attribute

Operational data that are constantly updated are stored in:

- ☐ data warehouses.
- ☐ data marts.
- ☒ databases.
- ☐ All of these

NoSQL databases can process both structured and unstructured data.

- ☒ True
- ☐ False

Which of the following are ways for companies to leverage Big Data to gain value? (Select all that apply.)

- ☒ Creating transparencies
- ☐ Reducing spending on technical initiatives
- ☒ Segmenting a population to customize actions
- ☐ Analyzing less data
- ☒ Providing automated algorithms to support decision-making

The data in a data warehouse have which of the following characteristics?

- ☐ They are typically retained for a defined, but limited, period of time.
- ☐ They are organized in a hierarchical structure.
- ☐ They are updated in real time.
- ☒ They are organized by subject.
- ☐ They are coded in different formats.

_____ is the cumulative store of subjective or experiential learning.

- ☒ Tacit knowledge
- ☐ Explicit knowledge
- ☐ Intellectual capital
- ☐ None of these

_____ is a process that helps organizations identify, select, organize, disseminate, transfer, and apply expertise that is part of the organization's memory and typically resides inside the organization in an unstructured manner.

- ☒ Knowledge management
- ☐ Discovery
- ☐ Decision support
- ☐ Data mining

Which of the following is an example of explicit knowledge?

- ☒ procedural guides
- ☐ experiences
- ☐ insights

- ☐ skill sets
- ☐ expertise

_____ is a method for analyzing and reducing a relational database to its most streamlined form.

- ☐ Query-by-example
- ☐ Relational analysis
- ☐ Structured query
- ☒ Normalization

A standardized language used to manipulate data is _____.

- ☐ MS-Access
- ☐ query-by-example language
- ☐ Oracle
- ☒ structured query language
- ☐ data manipulation language

_____ is a method for analyzing and reducing a relational database to its most streamlined form.

- ☐ Query by example
- ☐ Joining
- ☐ Relational analysis
- ☐ Structured query
- ☒ Normalization

Q 10.5:

Data _____ prevents data from being used by more than one application.

☐ A
redundancy

☐ B
security

☐ C

isolation

☐ D

independence

Q 10.1:

Which statement becomes true as the amount of data increases?

☐ A

The data becomes harder to manage.

☐ B

The chances of losing data increases.

☐ C

Data stability becomes more unpredictable.

☐ D

The data contains more inconsistencies.

Bill 198 was created to force companies to disclose the effectiveness of what type of controls?

☐ A

financial

☐ B

HR

☐ C

sales

☐ D

IT

Q 10.3:

Data governance is an approach to managing

☐ A

information storage.

☐ B

information access.

☐ C

information programming.

☐ D

information coding.

Q 10.4:

The process performed by designers to plan and create a database is called

☐ A

data base administration.

•

☐ B

the analysis and design phase.

•

☐ C

data definition.

☐ D

entity-relationship modelling.

Q 10.5:

Data _____ prevents data from being used by more than one application.

☐ A

redundancy

•

☐ B

security

☐ C

isolation

•

☐ D

independence

Q 10.21:

Data rot refers to

☐ A

issues with inconsistent data.

☐ B

the inability to process data.

☐ C

management of data errors.

☐ D

problems with storage media.

Q 10.25:

What is the management of information across an organization?

•

☐ A

data processing

•

☐ B

best data practices

• ✗

☐ C

data consistency

• ✓

☐ D

data governance

Q 10.26:

A database management system is different from a file management system because it

☐ A

offers direct access to an application's data.

• ✓

☐ B

provides access to all data in all applications.

☐ C

provides secure access to one program at a time.

• ✗

☐ D

offers access to data that is dependent on one application

Q 10.27:

Clickstream data can be obtained by

• ✓

☐ A

capturing a user's activity on a website.

☐ B

removing all data duplications.

☐ C

asking users to fill out a survey.

☐ D

limiting the amount of data stored.

Q 10.28:

It is common to refer to problems with storage media as

- ☐ A
data inconsistency.

- ☐ B
data degradation.

• ✓

- ☐ C

data rot.

• ✗

- ☐ D

data redundancy.

What factor complicates data management?

• ✗

- ☐ A

centrally located data



☐ B

too much unstructured data

•

☐ C

too much structured data

•

☐ D

too many user transactions

Q 10.30:

Unstructured data makes data management

more ▼

more

complicated.

Q 10.31:

Which statement is true about master data and transaction data?

• ☐ A :

Master data spans more information than transaction data.

• ☐ B :

Master data handles less data than transaction data handles.

• ☐ C :

Master data is more complex than transaction data.

• ☐ D :

Master data stores older customer information than transaction data.

Q 10.32:

The dissemination of data practices by an organization to all users applies to what issue?

•

☐ A

data degradation

• ✓

☐ B

data governance

•

☐ C

data duplication

• ✗

☐ D

data copyrighting

Q 10.33:

How does master data differ from transaction data?

•

☐ A

Master data contains detailed information, whereas transaction data contains generic information.

•

☐ B

Master data is used by high-level IT personnel, whereas transaction data is handled by low-level staff.

• ✓

☐ C

Master data covers the entire organization, whereas transaction data covers one process.

•

☐ D

Master data stores all types of data from the organization, whereas transaction data only stores marketing information.

Q 10.34:

If an older hard drive has data rot, which will most likely be true?

•

☐ A

Maintaining the data will require more programming.

☐ B

Protecting the data on the hard drive will be more difficult.

• ✓

☐ C

The data on the hard drive will be inaccessible.

• ✗

☐ D

It will be expensive to replace the hard drive.

Q 10.35:

Which pair is an example of internal and external sources of data generated by a company?

☐ A

clickstream data, backup data logs

☐ B

employee handbooks, transaction reports

• ✓

☐ C

annual reports, Internet websites

☐ D

government reports, balance sheets

Q 10.36:

Transferring data to a new storage device could prevent which problem?

• ✗

☐ A

Data can't be converted to another language.

• ✓

☐ B

Data can't be retrieved from an old device.

•

☐ C

Data can't be stored on an Internet site.

•

☐ D

Data can't be outputted to a printed format.

Q 10.37:

What step should be taken to prevent data rot?

• ✗

☐ A

Place the media in a non-humid place.

•

☐ B

Use the media for short time sessions.

•

☐ C

Avoid processing large amounts of data.

• ✓

☐ D

Avoid placing the media in sunlight.

Q 10.38:

A company spends years creating specialized data for each of its business processes. What is the downside of this practice?

• ✗

☐ A

The relationship between data pieces is ignored.

•

☐ B

The data provides too much detailed information.

• ✓

☐ C

It could lead to data repetition and conflicts.

•

☐ D

Accessing the data is limited to department staff only.

Q 10.39:

Broken storage media that has been placed in sunlight has most likely experienced data .
Rot

Q 10.40:

Data degradation can result from storing large amounts of data for a long time.

Q 10.41:

A university has used a library of 8-track tapes to store massive amount of student data. Which procedure can be used to improve the storage of data?

• ✗

☐ A

Store all data on the Internet.

•

☐ B

Save newer data in the system.

•

☐ C

Convert data to printed form.

• ✔

☐ D

Transfer the data to new media.

Q 10.42:

In an organization, an increase in MASTER data will directly require an increase in transaction data.

Q 10.43:

An increase in transaction data has a(n) DIRECT effect on the master data for an organization.

Q 10.44:

Which situation could cause data degradation?

• ✗

☐ A

data that cannot be retrieved

•

☐ B

data that has been disseminated

•

☐ C

data that has been copied

• ✓

☐ D

data that changes constantly

Q 10.45:

A city government has recently allowed all city-run agencies access to city documents. What procedure should be followed to ensure the proper usage of the documents?

• ☐ A :

The city should collect a fee for data usage by all users.

• ☐ B :

The city should store documents in only one location.

• ☐ C :

The city should require that documents be downloaded.

• ☐ D :

The city should issue policies regarding data practices to all users.

Q 10.46:

Mary purchases a new television on her credit card. What pieces of information would be applied to the store's master data? Select all that apply.

• ✓

☐ A

store

- ☐ B

customer name

- ☐ C

TV brand



- ☐ D

product sold



- ☐ E

vendor

Q 10.47:

Managing data can be a problem when data is **SCATTERED** in an organization.

Q 10.48:

What happens when data rot from obsolete equipment occurs?



- ☐ A

Preventing duplication of data is harder.

- - ☐ B
 - Updating the data requires more manpower.
 - - ☐ C
 - Converting the data becomes too expensive.
 - ✓
 - ☐ D
- Accessing the data on the media becomes difficult.

Q 10.49:

Data generated from multiple locations within an organization primarily causes problems with

- ✗
 - ☐ A
 - generalizing the data.
 - - ☐ B
 - creating databases.
 - - ☐ C
 - replicating the data.
 - ✓
 - ☐ D
- managing the data.

Q 10.50:

Repetition and conflicts of data often occur as a result of

- ✗
- ☐ A
- placing too many regulations on the use of the data.

- - ☐ Bcreating data from too many different media sources.
- - ☐ Cpermitting limited access to the data over time.
- - ☐ Ddeveloping specific uses for the data over time.

10.51:

A company considers data from its annual report but NOT its Internet site to be an **INTERNAL** source of data.

Q 10.52:

What might result from storing massive amounts of data over long periods of time? Select all that apply.

- - ☐ AThe data could degrade.
- - ☐ B

Transactional data could be lost.

• ✓

☐ C

Data repetition could occur.

• ✓

☐ D

Data rot could occur in the media.

•

☐ E

The Internet data could decrease.

Q 10.53:

A customer moves to a new address, in the database that stores that customer's information, what problem might occur?

• ✗

☐ A

data duplication

•

☐ B

data rot

• ✓

☐ C

data degradation

•

☐ D

data hoarding

Q 10.54:

The "product sold" information captured from a newly purchased television applies to what type of data? **MASTER DATA**

Q 10.55:

Through a new online initiative, a local parks and recreation department wishes to put all of its park schedules on the Internet for residents. The data will be accessible through a standard web browser and downloadable in multiple formats. Why will it become crucial to keep track of the master data of the department?

• ✗

☐ A

The master data will be accessed by users at anytime.

• ✔

☐ B

The master data will indicate how well the initiative works.

•

☐ C

The master data needs to be available for the department staff.

•

☐ D

The master data will contain the updated facility schedules for the parks.

.56:

Having a set of rules for handling organizational information is the most important aspect of

data governance

.

Q 10.57:

A parks and recreation department has put all of its facility schedules online for community residents to access. Through the new online initiative, residents will be able to view and print up-to-date schedules from the department through the Internet. What impact will this change have on the master data for the department?

•

☐ A

The master data will be utilized by more residents on a daily based.

• ✔

☐ B

The master data will become a barometer of how well the new initiative is doing.

•

☐ C

The master data will give the department feedback on which parks to close.

• ✗

☐ D

The master data will allow residents to communicate with the department.

Q 10.58:

The exponential growth of data is the biggest reason for what problem in an organization?

•

☐ A :

inability to access data from anywhere

•

☐ B :

inability to locate data at any time

•

☐ C :

difficulty in creating data storage

•

☐ D :

difficulty in managing data

Q 10.59:

For an organization, the most important benefit of data governance is that

• ✗

☐ A

the organization can manage the data according to each department's use.

•

☐ B

the organization can have multiple views of the data at any given time.

• ✓

☐ C

the organization can follow a set of rules for handling information.

☐ D

the organization can limit individual access to the information.

Q 10.60:

Data inconsistency occurs when

• ✓

☐ A

various versions of the data do not agree.

☐ B

because some items have multiple names for different purposes.

☐ C

whenever a database is updated.

☐ D

as a result of poor data governance.

Q 10.61:

When various versions of the data do not agree, this is referred to as data

☐ A

incongruence

• ✓

☐ B

inconsistency.

• ✗

☐ C

independence.

☐ D

integrity.

Q 10.62:

When data is stored in multiple locations, what situation occurs?

• ✗

☐ A

data inconsistency

• ✓

☐ B

data redundancy

☐ C

data independence

☐ D

data isolation

Q 10.63:

Data redundancy occurs when

• ✓

☐ A

data is stored in multiple locations.

☐ B

data pieces are not linked to each other.

☐ C

data is lost from one place in a database.



data copies do not agree with one another.

Chapter 11

Management is a process by which an organization achieves its goals through the use of resources (people, money, materials, and information). These resources are considered to be *inputs*. Achieving the organization's goals is the *output* of the process. Managers oversee this process in an attempt to optimize it. A manager's success often is measured by the ratio between the inputs and outputs for which he or she is responsible. This ratio is an indication of the organization's productivity.

The Manager's Job and Decision Making

To appreciate how information systems support managers, you first must understand the manager's job. Managers do many things, depending on their position in the organization, the type and size of the organization, the organization's policies and culture, and the personalities of the managers themselves. Despite these variations, however, all managers perform three basic roles (Mintzberg, 1973):¹

- **1.Interpersonal roles:** Figurehead, leader, liaison
- **2.Informational roles:** Monitor, disseminator, spokesperson, analyzer
- **3.Decisional roles:** Entrepreneur, disturbance handler, resource allocator, negotiator

Early information systems primarily supported the informational roles. In recent years, however, information systems have been developed that support all three roles. In this chapter, you will focus on the support that IT can provide for decisional roles.

A [decision](#) refers to a choice among two or more alternatives that individuals and groups make. Decisions are diverse and are made continuously. Decision making is a systematic process. Economist Herbert Simon (1977)² described decision making as composed of three major phases: intelligence, design, and choice. Once the choice is made, the decision is implemented. Figure 11.1 illustrates this process, highlighting the tasks that are in each phase. Note that there is a continuous flow of information from intelligence, to design, to choice (bold lines). At any phase, however, there may be a return to a previous phase (broken lines).

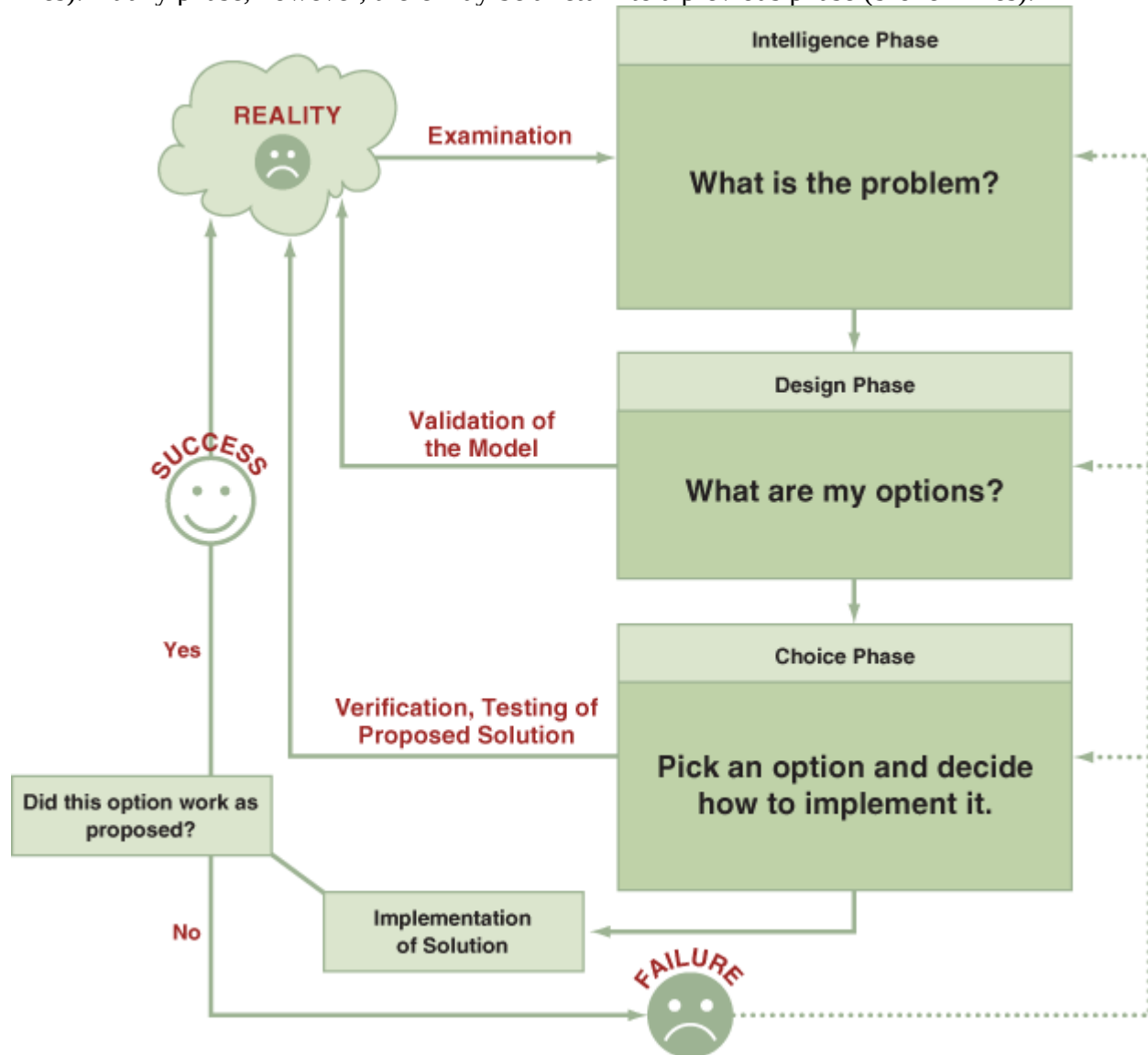


FIGURE 11.1 The process and phases in decision making.

This model of decision making is quite general. Undoubtedly, you have made decisions where you did not construct a model of the situation, validate your model with test data, or conduct a sensitivity analysis. The model we present here is intended to encompass *all* of the conditions that might occur when making a decision. For some decisions, some steps or phrases may be minimal, implicit (understood), or completely absent.

The decision-making process starts with the *intelligence phase*, in which managers examine a situation and then identify and define the problem or opportunity. In the *design phase*, decision makers construct a model for addressing the situation. They perform this task by making assumptions that simplify reality and by expressing the relationships among all of the relevant

variables. Managers then validate the model by using test data. Finally, decision makers set criteria for evaluating all of the potential solutions that are proposed. The *choice phase* involves selecting a solution or course of action that seems best suited to resolve the problem. This solution (the decision) is then implemented. Implementation is successful if the proposed solution solves the problem or seizes the opportunity. If the solution fails, then the process returns to the previous phases. Computer-based decision support assists managers in the decision-making process.

Why Managers Need IT Support

Making good decisions is very difficult without solid information. Information is vital for each phase and activity in the decision-making process. Even when information is available, however, decision making is difficult due to the following trends:

- The *number of alternatives* is constantly *increasing*, due to innovations in technology, improved communications, the development of global markets, and the use of the Internet and e-business. A key to good decision making is to explore and compare many relevant alternatives. The greater the number of alternatives, the more a decision maker needs computer-assisted searches and comparisons.
- Most decisions must be made *under time pressure*. It often is not possible to manually process information fast enough to be effective.
- Due to increased uncertainty in the decision environment, decisions are becoming more complex. It is usually necessary to *conduct a sophisticated analysis* in order to make a good decision.
- It often is necessary to rapidly access remote information, consult with experts, or conduct a group decision-making session, all without incurring major expenses. Decision makers, as well as the information they need to access, can be situated in different locations. Bringing everything together quickly and inexpensively represents a serious challenge.

These trends create major difficulties for decision makers. Fortunately, as you will see throughout this chapter, computerized decision support can be of enormous help.

Next you will learn about two aspects of decision making that place our discussion of BA in context—problem structure and the nature of the decisions.

A Framework for Computerized Decision Analysis

To better understand business analytics, note that various types of decisions can be placed along two major dimensions: problem structure and the nature of the decision (Gorry and Scott Morton, 1971).³ Figure [11.2](#) provides an overview of decision making along these two dimensions.

THE NATURE OF DECISIONS				
PROBLEM STRUCTURE		Operational Control	Management Control	Strategic Planning
	Structured	Accounts receivable Accounts payable Order entry 1	Budget analysis Short-term forecasting Personnel reports Make-or-buy analysis 2	Financial management Investment portfolio Warehouse location 3
	Semistructured	Production scheduling, Inventory control 4	Credit evaluation Budget preparation Plant layout Project scheduling Reward system Design 5	Building a new plant Mergers and acquisitions New product planning Compensation planning HR policies 6
	Unstructured	Building software Approving loans Operating a help desk 7	Negotiating Recruiting an executive Lobbying 8	R & D planning New technology development Social responsibility planning 9

FIGURE 11.2 Decision support framework.

Problem Structure.

The first dimension is *problem structure*, where decision-making processes fall along a continuum ranging from highly structured to highly unstructured (see the left column in Figure 11.2). *Structured decisions* deal with routine and repetitive problems for which standard solutions exist, such as inventory control. In a structured decision, the first three phases of the decision process—intelligence, design, and choice—are laid out in a particular sequence, and the procedures for obtaining the best (or at least a good enough) solution are known. These types of decisions are candidates for decision automation.

At the other extreme of complexity are *unstructured decisions*. These decisions are intended to deal with “fuzzy,” complex problems for which there are no cut-and-dried solutions. An unstructured decision is one in which there is no standardized procedure for carrying out any of the three phases. In making such a decision, human intuition and judgment often play an important role. Typical unstructured decisions include planning new service offerings, hiring an executive, and choosing a set of research and development (R&D) projects for the coming year. Although BA cannot make unstructured decisions, it can provide information that assists decision makers.

Located between structured and unstructured decisions are *semistructured* decisions, in which only some of the decision-process phases are structured. Semistructured decisions require a combination of standard solution procedures and individual judgment. Examples of semistructured decisions are evaluating employees, setting marketing budgets for consumer products, performing capital acquisition analysis, and trading bonds.

The Nature of Decisions.

The second dimension of decision support deals with the *nature of decisions*. All managerial decisions fall into one of three broad categories:

- **1.Operational control:** Executing specific tasks efficiently and effectively
- **2.Management control:** Acquiring and using resources efficiently in accomplishing organizational goals
- **3.Strategic planning:** The long-range goals and policies for growth and resource allocation

These categories are displayed along the top row of Figure [11.2](#).

The Decision Matrix.

The three primary classes of problem structure and the three broad categories of the nature of decisions can be combined in a decision-support matrix that consists of nine cells, as diagrammed in Figure [11.2](#). Lower-level managers usually perform the tasks in cells 1, 2, and 4. The tasks in cells 3, 5, and 7 are usually the responsibility of middle managers and professional staff. Finally, the tasks in cells 6, 8, and 9 are generally carried out by senior executives. Today, it is difficult to state that certain organizational information systems support certain cells in the decision matrix. The fact is that the increasing sophistication of information systems means that essentially any information system can be useful to any decision maker, regardless of his or her level in the organization or function in the organization. As you study this chapter, you will see that business analytics is applicable across all cells of the decision matrix.

As previously defined, **business analytics** is the process of developing actionable decisions or recommendations for actions based upon insights generated from historical data. Business analytics encompasses not only applications, but also technologies and processes. It includes both “getting data in” (to a data mart or warehouse) and “getting data out” (through BA applications).

Figure [11.3](#) illustrates the BA process in an organization. As you see in the figure, the BA process requires multiple steps, technologies, tools, and models. Let's look at each step of Figure [11.3](#) in turn, from left to right.

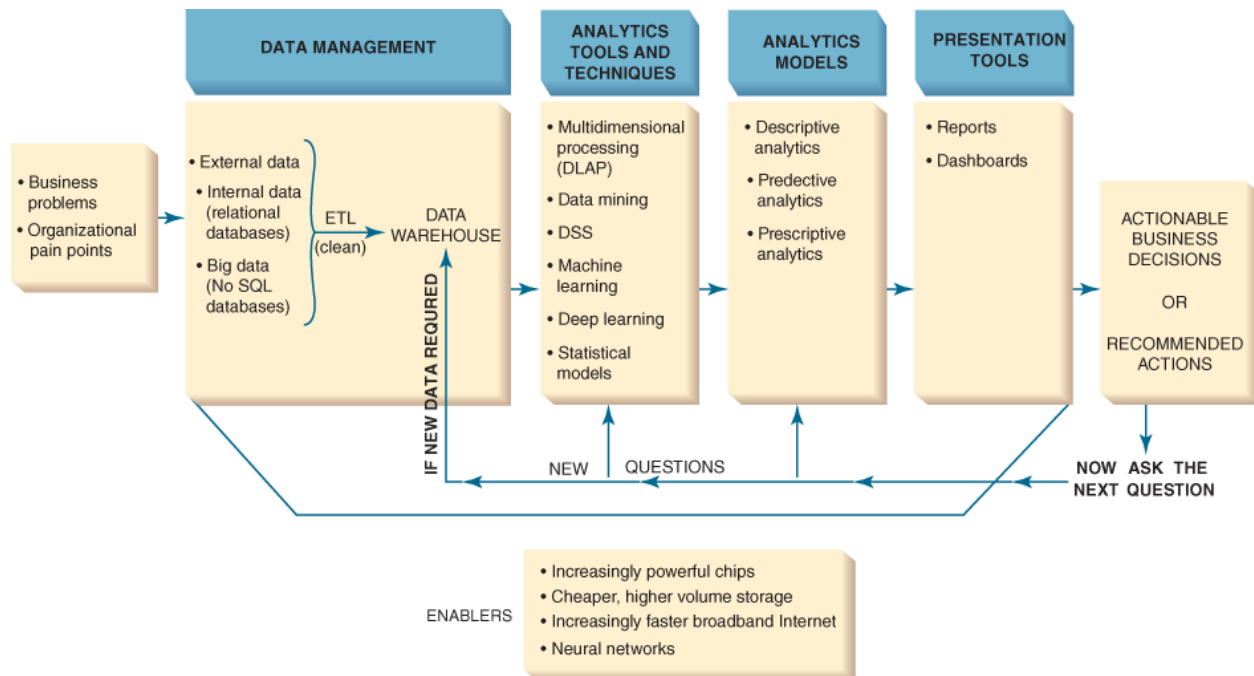


FIGURE 11.3 The Business Analytics Process

The entire BA process begins with a business problem, known as *pain points* to practicing managers. When organizations face business problems, they often turn to business analytics.

Before we begin our discussion of the BA process, let's emphasize the importance of the technologies that enable the entire process (see Figure 11.3). These technologies, all of which are improving exponentially, include microprocessors, storage, and networks.

Microprocessors (or chips) are becoming increasingly powerful (see Plug IT In 2p). For example, specialized graphics processing units (GPUs) are essential to neural networks, an analytics tool that we discuss in Plug IT In 5p. Digital storage capacity and access speed are both increasing exponentially. These advances are driving the cost of storage down exponentially as well. Transmission speed (bandwidth; see Chapter 4) in computer networks, particularly the Internet, is also increasing exponentially. As a result, decision makers are able to collaborate on difficult, time-sensitive decisions regardless of their locations.

To actually begin the BA process, an organization must have data (and lots of it!). As you saw from our discussion of enabling technologies, organizations are now able to analyze rapidly increasing amounts of data. As you learned in Chapter 3, these data originate from internal sources (e.g., structured data in relational databases) and external sources (e.g., unstructured data from social media). Organizations are now able to combine and analyze structured and unstructured data from many sources in the form of Big Data. At this point, organizations integrate and “clean” these data into data marts and data warehouses (see Chapter 3) through a process called extract, transform, and load (ETL). The data in the data warehouse are now available to be analyzed by a variety of analytics tools and techniques.

There are numerous analytics tools and techniques available to decision makers. These tools include Excel, decision-support systems, online analytical processing (OLAP), data mining, machine learning, deep learning, and neural networks. We discuss the first four in Section 11.3, and the last three in Plug IT In 5p. Note that there are many statistical modeling tools available in analytics software packages. These tools are beyond the scope of this chapter.

Organizations can apply analytics tools and techniques to data in the form of three possible analytics models: descriptive analytics, predictive analytics, and prescriptive analytics. We discuss these three models in Section 11.4.

All three models will produce results, which must be communicated to decision makers in the organization. In general, data scientists will use various analytics tools and techniques to examine analytics models. Many organizations have employees who “translate” the results of the analytics models into business terms for the decision makers. These translators often use presentation tools in the form of dashboards to get the message across visually (see Section [11.4](#)).

What is interesting about the analytics process is that once the results are obtained and presented, decision makers must be ready to “ask the next question.” Everyone involved in the BA process must use their creativity and intuition at this point. In addition, the results of the BA process almost always will lead to new, unanswered questions. To address these questions, the BA process starts over at the data management stage.

The Scope of Business Analytics



Video Lesson: The Scope of Business Analytics **Video Lesson: The Scope of Business Analytics**

The use of BA in organizations varies considerably. In smaller organizations, BA may be limited to Excel spreadsheets. In larger ones, BA often is enterprisewide, and it includes applications such as data mining/predictive analytics, dashboards, and data visualization. It is important to recognize that the importance of BA to organizations continues to grow. In fact, it is not an exaggeration to assert that for many firms, BA is now a requirement for competing in the marketplace.

Not all organizations use BA in the same way. For example, some organizations employ only one or a few applications, whereas others utilize enterprisewide BA. In general, there are three specific analytics targets that represent different levels of change. These targets differ in terms of their focus; scope; level of sponsorship, commitment, and required resources; technical architecture; impact on personnel and business processes; and benefits.

The Development of One or a Few Related Analytics Applications.

This target is often a point solution for a departmental need, such as campaign management in marketing. Sponsorship, approval, funding, impacts, and benefits typically occur at the departmental level. For this target, organizations usually create a data mart to store the necessary data. Organizations must be careful that the data mart—an “independent” application—does not become a “data silo” that stores data that are inconsistent with, and cannot be integrated with, data used elsewhere in the organization.

The Development of Infrastructure to Support Enterprisewide Analytics.

This target supports both current and future analytics needs. A crucial component of analytics at this level is an enterprise data warehouse. Because it is an enterprisewide initiative, senior management often provides sponsorship, approval, and funding. In addition, the impacts and benefits are felt throughout the organization.

MKT An example of this target is the 3M Corporation. Traditionally, 3M's various divisions had operated independently, using separate decision-support platforms. Not only was this arrangement costly, but it prevented 3M from integrating the data and presenting a “single face” to its customers. For example, sales representatives did not know whether or how business customers were interacting with other 3M divisions. The solution was to develop an enterprise data warehouse that enabled 3M to operate as an integrated company. As an added benefit, the costs of implementing this system were offset by savings resulting from the consolidation of the various platforms.

A variety of BA tools for analyzing data are available. They include Excel, multidimensional analysis (also called OLAP), data mining, and decision-support systems. There are also numerous statistical tools that business analytics models employ. These tools include linear and multiple regression, time series models, classification, clustering, and many others. A discussion of these diverse models, however, is beyond the scope of our discussion.

Excel

The most popular BA tool by far is Excel. For years, BA vendors “fought” against the use of Excel. Eventually, however, they decided to “join it” by designing their software so that it interfaces with Excel. How does this process work? Essentially, users download plug-ins that add functionality (e.g., the ability to list the top 10 percent of customers, based on purchases) to Excel. This process can be thought of as creating “Excel on steroids.” Excel then connects to the vendor's application server—which provides additional data analysis capabilities—which in turn connects to a backend database, such as a data mart or warehouse. This arrangement gives Excel users the functionality and access to data typical of sophisticated BA products, while allowing them to work with a familiar tool—Excel. Due to advances in the functionality of Excel, the following BA tools can often be accomplished by using this software package.

Multidimensional Analysis or Online Analytical Processing

Some BA applications include [online analytical processing](#), also referred to as [multidimensional analysis](#) capabilities. OLAP involves “slicing and dicing” data stored in a dimensional format, drilling down in the data to greater detail, and aggregating the data.

Consider our example from Chapter 3. Recall Figure 3 illustrating the data cube. The product is on the x-axis, geography is on the y-axis, and time is on the z-axis. Now, suppose you want to know how many nuts the company sold in the West region in 2013. You would slice and dice the cube, using *nuts* as the specific measure for product, *West* as the measure for geography, and *2013* as the measure for time. The value or values that remain in the cell(s) after our slicing and dicing is (are) the answer to our question. As an example of drilling down, you also might want to know how many nuts were sold in January 2013. Alternatively, you might want to know how many nuts were sold during 2013-2015, which is an example of aggregation, also called “rollup.”

Data Mining

[Data mining](#) refers to the process of searching for valuable business information in a large database, data warehouse, or data mart. Data mining can perform two basic operations: (1) predicting trends and behaviors and (2) identifying previously unknown patterns. Business analytics applications typically provide users with a view of what has happened; data mining helps to explain *why* it is happening, and it predicts what will happen in the future.

MKT Regarding the first operation, data mining automates the process of finding predictive information in large databases. Questions that traditionally required extensive hands-on analysis now can be answered directly and quickly from the data. For example, *targeted marketing* relies on predictive information. Data mining can use data from past promotional mailings to identify those prospects who are most likely to respond favorably to future mailings.

Another business problem that uses predictive information is the forecasting of bankruptcy and other forms of default.

Data mining can also identify previously hidden patterns in a single step. For example, it can analyze retail sales data to discover seemingly unrelated products that people often purchase together. The classic example is beer and diapers. Data mining found that young men tend to buy beer and diapers at the same time when shopping at convenience stores.

FIN One significant predictive analytics operation is detecting fraudulent credit card transactions. Over time a pattern emerges of the typical ways you use your credit card and your typical shopping behaviors—the places in which you use your card, the amounts you spend, and so on. If your card is stolen and used fraudulently, then the usage often varies noticeably from your established pattern. Data-mining tools can discern this difference and bring the issue to your attention.

Numerous data-mining applications are used in business and in other fields. According to a Gartner report (www.gartner.com), most Fortune 1000 companies worldwide currently use data mining, as the following representative examples illustrate. Note that in most cases the purpose of data mining is to identify a business opportunity in order to create a sustainable competitive advantage.

- *Retailing and sales:*

POM Predicting sales, preventing theft and fraud, and determining correct inventory levels and distribution schedules among outlets. For example, retailers such as AAFES (stores on military bases) use Fraud Watch from SAP (www.sap.com) to combat fraud by employees in their 1,400 stores.

- *Banking:*

FIN Forecasting levels of bad loans and fraudulent credit card use, predicting credit card spending by new customers, and determining which kinds of customers will best respond to (and qualify for) new loan offers.

- *Manufacturing and production:*

POM Predicting machinery failures and finding key factors that help optimize manufacturing capacity.

- *Insurance:*

POM Forecasting claim amounts and medical coverage costs, classifying the most important elements that affect medical coverage, and predicting which customers will buy new insurance policies. (See IT's About Business [11.2](#).)

- *Policework:*

POM Tracking crime patterns, locations, and criminal behavior; identifying attributes to assist in solving criminal cases. Consider PredPol (www.predpol.com), the predictive policing company. After deploying PredPol, the Los Angeles Police Department's Foothill Division noted a 20 percent decrease in crimes year over year from January 2013 to January 2014.

- *Healthcare:* Correlating demographics of patients with critical illnesses and developing better insights on how to identify and treat symptoms and their causes. In March 2013, Microsoft and Stanford University announced that they had mined the search data of millions of users to successfully identify unreported side effects of certain medications.

- *Marketing:*

MKT Classifying customer demographics that can be used to predict which customers will respond to a mailing or buy a particular product.

- **Politics:** In his FiveThirtyEight blog, Nate Silver famously analyzed polling and economic data to predict the results of the 2008 presidential election, calling 49 out of 50 states correctly. He then correctly predicted all 50 states in the 2012 presidential election.
- **Weather:**
 The National Weather Service is predicting weather with increasing accuracy and precision.
- **Higher education:** Desire2Learn (www.desire2learn.com) provides an application called Degree Compass that recommends courses based on students' majors, transcripts, and past course success rates. In March 2013, Degree Compass reported a 92 percent accuracy rate across four universities in predicting the grade that a student would receive in a course.
- **Social good:** As you read about in IT's About Business [11.4](#), Simpa Networks sells solar-as-a-service to poor households and small businesses. Simpa partnered with DataKind (www.datakind.org) whose data scientists analyzed Simpa's historical customer data to help Simpa assess potential customers.

Decision Support Systems

Decision support systems (DSSs) combine models and data to analyze semistructured problems and some unstructured problems that involve extensive user involvement. Models are simplified representations, or abstractions, of reality. Decision support systems enable business managers and analysts to access data interactively, to manipulate these data, and to conduct appropriate analyses.

Decision support systems can enhance learning and contribute to all levels of decision making. DSSs also employ mathematical models. Finally, they have the related capabilities of sensitivity analysis, what-if analysis, and goal-seeking analysis, which you will learn about next. You should keep in mind that these three types of analysis are useful for any type of decision-support application. Excel, for example, supports all three.

To learn about DSS and the three types of analysis, let's look at an example. Blue Nile (www.bluenile.com) is an online retailer of certified diamonds. The firm's website has a built-in decision support system to help customers find the diamond that best meets their needs. Blue Nile's DSS provides an excellent example of sensitivity analysis, what-if analysis, and goal-seeking analysis.

Access the Blue Nile website and click on “Diamonds” in the upper left corner. On the drop-down box, you will see “Search for diamonds.” There are many types of diamonds, but for this example click on “Round.” You will see:

- The number of round diamonds available for sale, again in the upper left corner. When we accessed the Blue Nile DSS, the firm offered 112,333 round diamonds for sale.
- Five slide bars labeled: Price, Carat, Cut, Color, and Clarity. Each slide bar represents a variable in Blue Nile's DSS.
- A list of each diamond accompanied by a value for each of the five variables. This list constitutes the data (all round diamonds available for sale) for your analyses.

Keep in mind that when you experiment with the Blue Nile DSS, the number of round diamonds available will vary from what we obtained when we accessed the DSS and performed the analyses. The reason is that the Blue Nile website is updated in near real-time as the company sells its diamonds.

Sensitivity Analysis.

Sensitivity analysis examines how sensitive an output is to any change in an input while keeping other inputs constant. Sensitivity analysis is valuable because it enables the system to adapt to changing conditions and to the varying requirements of different decision-making situations.

Let's perform *two sensitivity analyses* on the data:

- First, adjust the slide bars for the Carat variable, so that you will see only those round diamonds between 1.00 and 1.50 carats. Keep all the other slide bars in their fully open position. In that way, you keep the other variables constant. Note that the number of round diamonds available decreases dramatically. When we followed this procedure, the number of round diamonds available for sale dropped to 14,009.
- Second, adjust the slide bars for the Color variable, so that you will only see those round diamonds of D, E, and F color. Be sure to open the slide bars for Carat and keep the other slide bars in their fully open position. When we followed this procedure, the number of round diamonds available for sale dropped to 58,993.

Comparing the results of these two sensitivity analyses, we can say that the number of round diamonds for sale is more sensitive to changes in Carat than to changes in Color, with the other variables constant.

What-If Analysis.

A model builder must make predictions and assumptions regarding the input data, many of which are based on the assessment of uncertain futures. The results depend on the accuracy of these assumptions, which can be highly subjective. *What-if analysis* attempts to predict the impact of changes in the assumptions (input data) on the proposed solution.

Let's perform a *what-if analysis* on the data. A young man's fiancée has decided that she would like her engagement ring to be between one and two carats, at least a Very Good cut, an F color or better, and a clarity of at least VVS2 (VVS2 means “two very, very small imperfections”). Adjust the slide bars for all four of the variables at once. When we followed this procedure, the number of round diamonds available for sale dropped to 3,830.

Goal-Seeking Analysis.

Goal-seeking analysis represents a “backward” solution approach. Goal seeking attempts to calculate the value of the inputs necessary to achieve a desired level of output.

Let's perform a *goal-seeking analysis* on the data. When the young man in our example looked at the list of 3,830 diamonds (using the scroll bar on the right side of the list), he noticed that the prices ranged from \$6,356 to \$10,117. He told his fiancée that he had only \$5,000 to invest in a diamond. Consequently, they opened up the slide bars for the Carat, Cut, Color, and Clarity variables and adjusted the slide bar for the Price variable to be between \$4,500 and \$5,000. When we followed this procedure, the number of round diamonds available for sale dropped to 3,874.

The couple now had the problem of examining the list of diamonds to decide which combination of the four variables would be suitable. They did this by performing several what-if analyses:

- She decided that she really wanted a diamond between one and two carats. After adjusting the Carat slide bar, the number of round diamonds available dropped to 2,035.
- She then decided that she wanted a D, E, or F color. After adjusting the Color slide bar, the number of round diamonds available dropped to 424.
- Next, she chose a Cut that was at least Very Good. After adjusting the Cut slide bar, the number of round diamonds available dropped to 266.
- The couple noticed that all 266 diamonds had a Clarity variable of either SI1 (one small imperfection) or SI2 (two small imperfections). Either they could decide that this level of

clarity is acceptable, or go back and perform additional what-if analyses on other variables.

Organizations must analyze huge amounts of raw data in order to make sense out of them. This overall process is known as data reduction. *Data reduction* is the conversion of raw data into a smaller amount of more useful information. Descriptive, predictive, and prescriptive analytics are essentially steps in data reduction.

Descriptive Analytics

Descriptive analytics are the first step in data reduction. Industry analysts estimate that the majority of business analytics are descriptive. [Descriptive analytics](#) summarize what has happened in the past and allow decision makers to learn from past behaviors. Common examples of descriptive analytics are reports that provide historical insights regarding an organization's production, financials, operations, sales, finance, inventory, and customers.

MKT For example, Fandango (www.fandango.com), the leading online ticket seller for movie theaters, wants to analyze the movie preferences of its customers during the past year. The firm sells millions of tickets to approximately 20,000 movie theaters across the United States. Fandango captures data about customers, movie theaters, ticket sales, and show times. Using a sample of movie titles, Fandango analysts can investigate the correlations among total sales for different movies. Using a sample of moviegoers, they can calculate the average ticket sales for a week, the most popular movie, the distribution of customers among the movie genres, the busiest hours of the day in the movie theater, and many other analyses. These descriptive analyses help Fandango set ticket prices, offer discounts for certain movies or show times, and assign show times of the same movie in different theaters.

For other examples of descriptive analytics, see this chapter's opening case, closing case [11.1](#), closing case [11.2](#), and all IT's About Business. IT's About Business [11.2](#) shows how Esurance successfully employs descriptive analytics to provide personalized quotes to prospective customers.

IT's About Business11.2

Esurance Uses Analytics to Provide Personalized Quotes

MKT Esurance (www.esurance.com) sells automobile insurance directly to consumers online and over the telephone. The firm offers services to almost 90 percent of the U.S. population in 40 states. The insurer also functions as a shopping and comparison site for customers in the 10 remaining states. Esurance is a wholly owned subsidiary of Allstate (www.allstate.com).

For most customers, choosing the right insurance is complicated. Esurance wanted to make it easier for its Web customers to make choices quickly and knowledgeably. Specifically, Esurance wanted to make the online purchasing process equivalent to a face-to-face meeting with an insurance agent. As a result, the company developed an analytics software package called the Coverage Rules Engine (CRE).

The CRE integrates and analyzes data from two sources. First, Esurance staff members formulate business rules by analyzing queries against the historical information in the firm's

database and by talking with Esurance's agents, who assist customers online, over the phone, and in person. The insurer spent about 18 months adding business rules to the CRE. Second, the CRE relies on the answers from a questionnaire filled out by customers. These answers produce about 55 variables that the CRE can utilize to modify the initial package presentation. By analyzing the two types of data, the CRE can provide almost unlimited customization—up to 8 billion possible packages of coverage.

Consider this example of how Esurance uses its CRE. A common business practice is “upselling”—promoting additional products or services to customers after they've made their initial purchase. Esurance noted that in the insurance business, agents dealing with customers in person would often suggest they add towing and roadside emergency insurance, which was a popular add-on. But Esurance customers on the Web would rarely add towing to their packages. Consequently, Esurance conducted an experiment. The company added a button on its site that asked customers before completing their transaction if they wanted to add towing to their policies. If not, they just completed their purchase. With this new feature, many customers did select the towing option, just like with in-person sales.

Thanks to CRE, shopping for insurance online is becoming more and more like the experience with an agent face-to-face. Descriptive analytics help Esurance to instantly customize and present the packages and options that are most likely to succeed with the customer. The company continuously monitors how well the CRE is doing by comparing the numbers of customers who buy a policy with those who leave the site without making a purchase.

Esurance also wants to make sure customers don't buy too little or too much insurance. It's convinced that the CRE comes up with the right combination for each customer. Not only does Esurance feel that its quotes and packages are optimal, but that they are provided in half the time (15 minutes) that another online car insurer (GEICO) advertises.

Although the CRE platform cost \$1 million to develop and implement, the company has saved between \$500,000 and \$1 million annually in further IT costs, including any subscriptions to analytics software-as-a-service (SaaS).

Sources: Compiled from C. Babcock, “Esurance Puts Analytics Closer to the Customer,” *InformationWeek*, April 28, 2015; D. Jergler, “Google Compare May Go Beyond Auto Insurance,” *Insurance Journal*, March 11, 2015; G. Bartholomew, “Demystifying the Rate Madness in Insurance Advertising,” *EagleEye Analytics*, October 17, 2014; S. Overby, “Progressive Insurance Uses Data Analytics to Fine-Tune Ad Strategy,” *CIO*, September 28, 2014; R. Clarke and A. Libarikian, “Unleashing the Value of Advance Analytics in Insurance,” *McKinsey*, August, 2014; D. Wing, “Evolution of Homeowners Data and Analytics,” *Verisk Analytics*, Quarter 2, 2014; C. Boulton, “Auto Insurers Bank on Big Data to Drive New Business,” *The Wall Street Journal*, February 20, 2013; www.esurance.com, accessed August 28, 2015.

Questions

1. Describe how Esurance's CRE analytics package contributes to the customer's experience.
 2. Provide an example of a predictive analytics application that Esurance could implement.
 3. Provide an example of a prescriptive analytics application that Esurance could implement.
- The emergence of technology for capturing, storing, and using real-time data (e.g., the Internet of Things, see Chapter 10) has enabled real-time BA users to employ analytics models to analyze data in real time. In addition, it helps organizations to make decisions and to interact with customers in new ways. Real-time BA is closely related to descriptive analytics because the

focus of decisions is real time, rather than at some point in the future. IT's About Business [11.3](#) illustrates how TaKaDu uses sensor data as inputs into real-time analytics software to monitor the pipes of water utilities.

IT's About Business11.3

TaKaDu's Dashboard Helps to Conserve Water

POM Israel is a desert nation that has been dealing with a drought caused by record-low rainfall since 2008. Therefore, freshwater sources in Israel and the surrounding region are precious. Israelis use water from three sources: recycled wastewater (about 85 percent); a reservoir, filled by pipelines from the Sea of Galilee 90 miles to the north (some 10 percent); and desalination (approximately 5 percent).

Regardless of the source of water, the pipes carrying this precious resource are all-important. About one third of water distributed by utilities around the world is lost to leaks. Consequently, the ability to detect leaks instantly is the most valuable conservation technology.

In 2008, startup TaKaDu (www.takadu.com) designed cloud-based analytics software that utilizes raw data from smart sensors placed in the pipes of the water network. (See our discussion of the Internet of Things in Chapter 10.) These sensors monitor the flow rates, pressure, and quality of the water, and they identify problems in the meters, valves, pipes, and other system equipment. The software's algorithms then analyze these data to determine when and where water is leaking. As an added benefit, the sensors can detect weaknesses in the pipes that could lead to future leaks. Consequently they enable utilities to prevent leaks before they occur.

TaKaDu provides its results in the form of dashboards on employee smart phones. By scanning the dashboards, company employees monitor whether the meters are accurate, the water quality and pressure are optimal, the water flow is normal, and the pumps are operating properly. How do employees know if the water flow is normal and therefore when use is abnormal? The TaKaDu software determines a baseline of regular use throughout the day. For example, it establishes that water use is highest when people are typically at home—in the mornings before they go to work and in the evenings when they return.

The software also considers local factors. At a Dutch utility, for instance, the system noted regular peaks of flow one Friday afternoon. It turned out that increased water use happened during breaks in play during a World Cup game between the Netherlands and Spain, when fans used their bathrooms.

In addition to leaks and use patterns, TaKaDu software can also help pinpoint problems that could be due to theft. A utility in Melbourne, Australia, Unitywater (www.unitywater.com), detected spikes of water coming from a fire hydrant. Officials discovered that a strawberry farmer was siphoning water from the hydrant. Network-wide, Unitywater saved more than one billion liters of water in the first 12 months of implementing the TaKaDu system, with a value of more than \$2 million. The utility saves not only money, but time, because it now takes 60 percent less time to repair problems.

TaKaDu software is most effective when it works with other systems. For example, it complements the sound equipment developed by the technology company Aquarius Spectrum (www.aquarius-spectrum.com). TaKaDu software identifies the location of a leak within a neighborhood, and then Aquarius's technology detects the exact pipe that the leak is coming from. Another company, Curapipe (www.curapipe.com), has technology that plugs leaks automatically without the need for digging.

TaKaDu has helped Israel to enjoy higher agricultural yields during the current drought than the country had previously achieved in nondrought years. Recall that global utilities tend to lose 30 percent of the water they distribute. That figure is just 10 percent for Jerusalem's utility, Hagihon, since implementing TaKaDu. In mid-2015, Israel even enjoyed a water surplus, some of which (about 150 million cubic meters per year) it pumps to Jordan and the Palestinian Authority.

By mid-2015, TaKaDu software had been adopted by 14 other utilities in cities ranging from Campo Grande, Brazil, to Bilbao, Spain. In 2015, Australia's largest utility, Sydney Water (www.sydneywater.com.au), adopted the system as well. Also in 2015, TaKaDu introduced its service for U.S. utilities that monitor water quality, an activity that is closely regulated by the U.S. Environmental Protection Agency.

Unfortunately, despite this progress, in mid-2015 only 1 out of 5 utilities worldwide were using smart sensors in their water networks, and in the United States, it's an even lower proportion. But TaKaDu expects the use of its technology will increase, especially among American utilities, as the cost of hardware declines, networks age, and droughts become more common.

Sources: Compiled from “3M Partners with TaKaDu to Offer Water Utilities a More Complete Solution,” *TaKaDu Press Release*, August 26, 2015; D. Asper, “TaKaDu's Water-Saving Technology Saves Australia Millions of Dollars,” *NoCamels*, April 6, 2015; J. Foreshe, “TaKaDu Helps Keep Water Flowing for Unitywater,” *The Australian Business Review*, March 31, 2015; A. Little, “Anybody Call a Plumber?” *Bloomberg BusinessWeek*, January 12-18, 2015; J. Neeman, J. Buxton, and K. Cornish, “Water Utilities Turn to New Technologies to Increase Intelligence in Systems,” *Breaking Energy*, December 4, 2014; H. Moreno, “Transforming Utilities Using Data Analytics,” *Forbes*, September 30, 2014; S. Udasin, “Hagihon, TaKaDu Sign Contract for Jerusalem Water Management,” *The Jerusalem Post*, September 10, 2014; J. Ollagnier, “Water Utilities: Can They Use Analytics for Smart Monitoring?” *Accenture*, March 28, 2014; www.takadu.com, accessed August 27, 2015.

Questions

1. How does the TaKaDu system utilize the Internet of Things? (Hint: See Chapter 10.)
2. Provide an example of how TaKaDu uses its system for predictive analytics.
3. Provide an example of how TaKaDu could use its system for prescriptive analytics.
4. Refer to Chapter 5. Is the TaKaDu system a strategic information system for Jerusalem? Why or why not?

Predictive Analytics

Predictive analytics are the next step in data reduction. [Predictive analytics](#) utilize a variety of analytics techniques and tools to examine recent and historical data in order to detect patterns and predict future outcomes and trends. Predictive analytics provide estimates about the likelihood of a future outcome.

The purpose of predictive analytics is *not* to tell decision makers what will happen in the future. Predictive analytics can only forecast what *might* happen in the future, because predictive analytics are based on probabilities.

MKT Continuing our example of Fandango. How does the ticket seller know when to send e-mails to its members with discount offers for a specific movie on a specific day? Consider John Jones. Predictive analytics tools analyze terabytes of data to determine that while John likes science fiction movies, he has not seen the latest science fiction movie, which has been in theaters since the previous Friday.

Predictive analytics are used throughout organizations in every industry. Let's look at some examples.

- - MKT** Predictive analytics drive the coupons you receive at the grocery cash register. In the United Kingdom, grocery giant Tesco (www.tesco.com) predicts which discounts will be redeemed in order to target more than 100 million personalized coupons annually at cash registers in 13 countries. This process increased coupon redemption rates by a factor of 3.6 over previous methods.
- - MKT** Websites predict which ads you will click in order to instantly choose which ad to show you, a process that drives millions of dollars in new revenue.
- •President Obama was re-elected in 2012 with the help of voter prediction. His campaign predicted which voters would be positively persuaded by campaign contact, and which voters would be negatively impacted.
- •Leading online dating companies Match (www.match.com), OKCupid (www.okcupid.com), and eHarmony (www.eharmony.com) predict which prospect on your screen will be the most compatible with you.
- •Student essay grade prediction has been developed for automatic grading. The system grades as accurately as human graders.
- - MKT** Wireless carriers predict how likely it is you will cancel and defect to a competitor (churn), possibly before you have decided to do so. The predictions are based on factors such as dropped calls, your phone usage, your billing information, and whether your contacts have already defected.
- - POM** Allstate Insurance tripled the accuracy of predicting bodily injury liability from car crashes based on the characteristics of the insured vehicle. This process results in approximately \$40 million annual savings.
- •Stanford University data scientists used predictive analytics to diagnose breast cancer better than human physicians by discovering an innovative method that takes into account a greater number of contributing factors in a tissue sample.
- •Officials in Oregon and Pennsylvania are using predictive analytics to assess the risk that a convict will offend again.
- - FIN** Financial services firms use predictive analytics to produce credit scores. They use these scores to determine the probability of customers making future credit payments on time.
- •Other examples of predictive analytics include understanding how sales might close at the end of the year, predicting what items customers will purchase together, and forecasting inventory levels based on a large number of variables.
- •Sentiment analysis is another type of predictive analysis. The input to this type of model is plain text (e.g., ratings, recommendations, tweets, Facebook posts) and the output of

the model is a sentiment score. This score can be positive or negative. This score could also be a number between -1 and $+1$, indicating the degree of positivity or negativity.

For other examples of descriptive analytics, see this chapter's opening case, closing case [11.1](#), closing case [11.2](#), and all IT's About Business. IT's About Business [11.4](#) illustrates how a startup company in India uses analytics to predict which of its customers will be a good credit risk.

IT's About Business 11.4

POM Simpa Networks Provide Solar Energy to India's Poor

MKT Worldwide, approximately 1.6 billion people do not have access to electricity, and another 1 billion have only unreliable access. Many of these people depend on kerosene lanterns and battery-powered flashlights for light. Moreover, these same people often earn less than \$10 per day, and they spend up to 30 percent of their incomes on inefficient and expensive means of accessing electricity.

The lack of electricity is particularly acute in India, with 75 million families not having access. Consequently, these people rely on “dirty” fuels such as kerosene, which they use in lamps. There is hope, however. There are effective alternatives to electricity, such as solar power, which can meet the needs of homes and small businesses.

To address these energy needs, Simpa Networks (www.simpanetworks.com), a startup technology company founded in 2010, sells solar power not as a system but as a service, to rural households and businesses. Its mission is to bring sustainable energy to those who currently do not have enough money to pay for their energy needs.

Simpa's customers use the “Progressive Purchase” pricing model. Under this model, the consumer makes a series of payments, each of which unlocks the solar home system for a specified amount of energy consumption. When the prepaid consumption is exhausted, the solar home system is temporarily disabled until the customer makes another payment. When the consumer has fully paid the total purchase price of the product, then Simpa restores full functionality. The system is permanently unlocked, and it produces energy for free.

Simpa's problem is that, because it has limited resources, it must be selective in deciding which families and businesses to support. As a result, the company turned to DataKind for help. DataKind (www.datakind.org) is a nonprofit organization that connects data scientists with organizations working to address humanitarian issues.

DataKind's scientists used Simpa's historical data on customer energy usage and payment behavior as inputs into a credit-scoring model that helps Simpa better assess new customers. The objective is to offer the most appropriate services and support. That is, the model enables Simpa to become “smarter” in selecting customers. The model also enables Simpa to take risks when lending to rural farmers who cannot turn to banks for loans.

Simpa's solar-as-a-service has resulted in huge time savings for those doing farming and household tasks such as cooking and cleaning. The system also has health benefits, including better quality of light and better air quality thanks to reduced kerosene fumes and wood smoke. Prior to Simpa's system, approximately 80 percent of energy-poor individuals suffered eye irritation from fumes. After customers deployed the system, that number fell to 28 percent. Further, fire accidents dropped to zero. The system also helps increase sales in shops that can stay open longer thanks to cheaper energy.

By mid-2015, Simpa's clean, reliable energy could be found in more than 63,000 rural households and small businesses in India. The credit-scoring model helped Simpa provide its system to the optimal mix of customers. In that way, the company was able to receive an excellent return on its investment and, in turn, help additional families and businesses.

Sources: Compiled from M. Barlow, “Data and Social Good,” O'Reilly, August 15, 2015; “Simpa Networks: Making Solar Power Affordable in Rural India,” OPIC, 2014; J. Novet, “DataKind's Do-Good Data-Science Projects Arrive in 5 More Cities,” Venture Beat, August 21, 2014; B. Prows, “Rural Solar Energy Lights India's Future,” MobileBeyond, July 12, 2014; A. Satter, “Watch How Solar Power Is Transforming Rural India,” Think Progress, July 10, 2014; “We Envision a World without Energy Poverty by 2030: Bijli Program Update,” The Climate Group, July 3, 2014; “Affordable Pay-As-You-Go Solar Power for India's Energy-Poor Homes,” ADB Knowledge Showcases, August 2013; www.datakind.org, www.simpanetworks.com accessed August 28, 2015.

Questions

1. Describe how Simpa Networks uses descriptive analytics to further its mission.
2. How does predictive analytics help Simpa Networks provide solar energy to India's underserved population?
3. Describe how Simpa Networks could use prescriptive analytics to further its mission.

Prescriptive Analytics

Prescriptive analytics go beyond descriptive and predictive models by recommending one or more courses of action and showing the likely outcome of each decision. Predictive analytics does not predict one possible future, but rather multiple future outcomes based on the decision maker's actions. Prescriptive analytics attempt to quantify the effect of future decisions in order to advise on possible outcomes before the decisions are actually made.

Some companies are successfully using prescriptive analytics to optimize production, scheduling, and inventory along the supply chain to make sure that they deliver the right products at the right time in order to optimize the customer experience.

Prescriptive analytics requires a predictive model with two additional components: actionable data and a feedback system that tracks the outcome produced by the action taken. Because a prescriptive model is able to predict the possible consequences based on different choices of action, it can also recommend the best course of action for any pre-specified outcome.

POM Continuing with the Fandango example: The company uses prescriptive analytics to be able to change ticket price offerings every hour. Fandango has learned when the most desirable movie times are by analyzing millions of show times instantaneously. This data is then used to set an optimal price at any given time, based on the supply of show times and the demand for movie tickets. This process maximizes profits. The data from each show provides the feedback as to the contribution of each ticket price to profits.

For examples of prescriptive analytics, see this chapter's two closing cases. Pay particular attention to how the organizations in these two cases progress from descriptive analytics, to predictive analytics, and then on to prescriptive analytics.

Presentation Tools

After applying BA models, the results are presented to users in visual formats such as text, graphics, and tables. This process, known as *data visualization*, makes IT applications more attractive and understandable to users. A variety of visualization methods and software packages that support decision making are available. Dashboards are the most common BA presentation tool. We also take a look at another valuable data visualization tool: geographic information systems.

Dashboards.

Dashboards evolved from executive information systems, which were information systems designed specifically for the information needs of top executives. Today, however, many employees, business partners, and customers use digital dashboards.

A [dashboard](#) provides easy access to timely information and direct access to management reports. It is user friendly, it is supported by graphics, and, most importantly, it enables managers to examine exception reports and drill down into detailed data. Table [11.1](#) summarizes the various capabilities common to many dashboards. Moreover, some of the capabilities discussed in this section have been incorporated into many BA products, as illustrated in Figure [11.4](#).

Table 11.1

Capability	Description
Drill down	The ability to go to details, at several levels; it can be done by a series of menus
Critical success factors (CSFs)	The factors most critical for the success of business. These can be organizational
Key performance indicators	The specific measures of CSFs.
Status access	The latest data available on KPI or some other metric, often in real time.
Trend analysis	Short-, medium-, and long-term trend of KPIs or metrics, which are projected us
Exception reporting	Reports highlight deviations larger than certain thresholds. Reports may include



Image courtesy of Dundas Data Visualization, Inc., 2014 (www.dundas.com).

FIGURE

11.4 Sample performance dashboard.

One outstanding example of a dashboard is Bloomberg LP (www.bloomberg.com), a privately held company, that provides a subscription service that sells financial data, software to analyze these data, trading tools, and news (electronic, print, TV, and radio). All of this information is accessible through a color-coded Bloomberg keyboard that displays the desired information on a computer screen, either the user's screen or one that Bloomberg provides. Users can also set up their own computers to access the service without a Bloomberg keyboard. The subscription service plus the keyboard is called the Bloomberg Terminal. It literally represents a do-it-yourself dashboard, because users can customize their information feeds as well as the look and feel of those feeds (see Figure 11.5).



Carlos Osario/Zuma Press.

FIGURE 11.5 Blo

omberg Terminal.

In another example, a human resources dashboard/scorecard developed by iDashboards, one of the leading BA software vendors. At a glance, users can see employee productivity, hours, team, department, and division performance in graphical, tabular, summary, and detailed form. The selector box to the left enables the user to easily change between specific analyses to compare their performance.

A unique and interesting application of dashboards to support the informational needs of executives is the Management Cockpit. Essentially, a Management Cockpit is a strategic management room containing an elaborate set of dashboards that enable top-level decision makers to pilot their businesses better. The goal is to create an environment that encourages more efficient management meetings and boosts team performance via effective communication. To help achieve this goal, the dashboard graphically displays KPIs and information relating to critical success factors on the walls of a meeting room called the *Management Cockpit Room* (see Figure 11.6). The cockpit-like arrangement of instrument panels and displays helps managers visualize how all of the different factors in the business interrelate.



The Management Cockpit is a registered trademark of SAP, created by Professor Patrick M. Georges.

FIGURE 11.6 Man

agement Cockpit.

Within the room, the four walls are designated by color: Black, Red, Blue, and White. The Black Wall displays the principal success factors and financial indicators. The Red Wall measures market performance. The Blue Wall projects the performance of internal processes and employees. Finally, the White Wall indicates the status of strategic projects. The Flight Deck, a six-screen, high-end PC, enables executives to drill down to detailed information. External information needed for competitive analyses can easily be imported into the room.

Board members and other executives hold meetings in the Management Cockpit Room. Managers also meet there with the comptroller to discuss current business issues. The Management Cockpit can implement various what-if scenarios for this purpose. It also provides a common basis for information and communication. Finally, it supports efforts to translate a corporate strategy into concrete activities by identifying performance indicators.

Geographic Information Systems.

A geographic information system (GIS) is a computer-based system for capturing, integrating, manipulating, and displaying data using digitized maps. Its most distinguishing characteristic is that every record or digital object has an identified geographical location. This process, called *geocoding*, enables users to generate information for planning, problem solving, and decision making. In addition, the graphical format makes it easy for managers to visualize the data. There are countless applications of GISs to improve decision making in both the public and private sectors.

Children's National Health System offers injury prevention advice to the community. Clinicians have found that using geospatial data helps them accomplish this mission. The healthcare center integrated its existing electronic health records system with GIS software from ESRI (www.esri.com) to display health data with geospatial coordinates. One of the integrated system's first projects focused on pediatric burn cases.

GIS mapping enabled the clinic to identify the hotspots where injuries were occurring on a map. That map allowed staff members to develop prevention programs tailored to the demographics of areas with high rates of injuries. For example, if the system identifies a cluster

of children with burns in an Hispanic neighborhood, the staff will work with community groups to provide parents with Spanish-language information about safety.

The new system has produced results. The clinic is seeing fewer burn patients overall and fewer patients requiring high-level burn care. Children's National Health System is now using its system to map concentrations of other medical conditions, such as obesity and asthma.

- **Use a decision support framework to demonstrate how technology supports managerial decision making at each phase of the decision-making process.**
When making a decision, either organizational or personal, the decision maker goes through a three-step process: intelligence, design, and choice. When the choice is made, the decision is implemented. In general, it is difficult to state which information systems support specific decision makers in an organization. Modern information systems, particularly business analytics systems, are available to support everyone in an organization.
- **2. Describe each phase of the business analytics process.**
Business analytics is the process of developing actionable decisions or recommendations for actions based on insights generated from historical data. The phases in the business analytics process are shown in FIGURE 11.3 and include data management, analytics tools and techniques, analytics models, and presentation tools.
- **3. Describe each of the various analytics tools and examples of their uses.**
These techniques and tools include Excel, decision support systems, online analytical processing (OLAP), data mining, machine learning, deep learning, and neural networks. We discuss the first four in Section 11.3, and the last three in Plug IT In 5p. Note that there are many statistical modeling tools available in analytics software packages. These tools are beyond the scope of this chapter
- **4. Provide a definition and a use case example for descriptive analytics, predictive analytics, and prescriptive analytics.**
Descriptive analytics summarize what has happened in the past and allow decision makers to learn from past behaviors. Predictive analytics utilize a variety of analytics techniques and tools to examine recent and historical data in order to detect patterns and predict future outcomes and trends. Prescriptive analytics go beyond descriptive and predictive models by recommending one or more courses of action and showing the likely outcome of each decision. We leave the examples of each analytics model to you.

Closing Case 11.1 Analytics in the National Basketball Association

POM The Problem

Historically the primary method of judging how well a player or team was performing was the “eye test.” This term refers to the intuitive feeling that people with long experience in a sport acquired from watching games and practices. Today, professional sports teams are utilizing analytics to provide data-driven judgments.

The analytics revolution in professional sports began in baseball, as highlighted in the book and the movie *Moneyball*. Baseball is a relatively simple sport to analyze statistically because it

centers on a sequence of one-on-one confrontations between a batter and a pitcher. Further, each play has an obvious start point and end point. Statisticians call each of those plays a “state.”

In contrast the discrete, state-to-state action in baseball, basketball is a constant flow. Players switch instantly from offense to defense. Moreover, regardless of a player's position, he or she can be anywhere on the court at any time. The game has no states, so analysts could not statistically determine the odds of a given outcome (e.g., a player making a shot).

Consequently, modern analytics focuses on the locations and movement of the players and the ball. Essentially, analytics in the National Basketball Association (NBA; www.nba.com) is a mapping and data visualization problem. The challenge is to visually depict data about movement through space and time; that is, to make numbers visible.

The Solution

The First System. Kirk Goldsberry, a longtime basketball fan with a Ph.D. in geography, undertook the task of developing analytics software for professional basketball. First, he divided the 1,284 square feet of the court where players actually shoot—the area that stretches from just outside the three-point line (roughly 25 feet) to the basket—into cells. Then he searched for data.

Obtaining the relevant data for accurate analysis was difficult. Tracking 10 players in constant motion is not a simple process. On ESPN.com, Goldsberry found statistics for every shot taken in the NBA, including who took the shot, from where, and whether it went in the basket. He then developed a database with the spatial coordinates for all 700,000 shots taken in every NBA game from 2006 to 2011.

Goldsberry next analyzed his data to generate maps that showed where a given player shot, how often, and whether or not the shot was good. Goldsberry called his system CourtVision. This system revealed differences in players that had not been previously quantified. For example, Ray Allen, one of the NBA's best shooters, had several areas where he made a high percentage of his shots from three-point range. However, he rarely attempted any mid-range shots.

For the first time, fans could see the types of shots their favorite players took as well as the relative value of those shots. However, CourtVision did not take into account variables such as who the defender was or what else was happening on the court. Nevertheless, Goldsberry's system provided team management with an initial tool to evaluate players.

Today's System. The next opportunity to collect data came when a company called Stats (www.stats.com) developed a six-camera setup for basketball. The camera system, which is now employed in all 29 NBA arenas, tracks each player on the court throughout every game. It therefore provides a complete view of the entire game, including tracking individual players and ball possession.

Stats offered its data to Goldsberry. The data were more specific than the data Goldsberry had obtained from ESPN.com. Once Goldsberry had the data, he could analyze them to answer any number of questions.

- Players who “draw the defense” can be quantified as ones who pass the ball effectively when two or more players are guarding them.
- “Getting good spacing” visualizes which players control which parts of the court.
- “On-ball defense” assesses how effectively a player defending the ball decreases his opponent's chance of scoring.

In addition, analyzing the camera data enabled Goldsberry to understand one of the most difficult aspects of basketball: defense. Historically, teams had relied on counting statistics—for example, how many steals, how many blocks—to capture a player's defensive value. The new system provided a much more sophisticated picture of the game.

Goldsberry began by observing that the area right around the basket is the most important real estate on the court to defend because this area is where offensive players shoot the highest percentage. Therefore, he analyzed how effectively defenders within five feet of the basket were able to prevent opponents from scoring. He found that the average NBA defender allowed a shooting percentage of 49.7 in that area.

Utilizing his new data, Goldsberry identified two classes of defense. In the first type, defenders blocked or altered their opponents' shots - that is, they reduced "shooting efficiency." In the 2014 NBA season, for example, Indiana Pacers center Roy Hibbert and Milwaukee Bucks center Larry Sanders led the NBA, holding opponents to 38 percent.

The second approach to defense was more subtle. Goldsberry found that some players reduced the frequency of their opponents' shots, not just their efficiency. By comparing the average rate of shots to the rate when specific defenders were guarding the area, he could calculate when the number of shots decreased. Again in the 2014 NBA season, the best player at this type of defense was Houston Rockets center Dwight Howard, who caused opposing teams to shoot 9 percent less frequently around the basket. As opponents shot less often around the basket, they took more mid-range shots, which are the least productive shots in the NBA.

The Results

Goldsberry essentially divided basketball games into slices of time and then employed the same kinds of analyses that analysts had been applying to the states in baseball. He could then quantify the value—in terms of points—of every move on the court, from an entry pass into the post (the area close to the basket) to a drive to the basket. These analyses created a new method to evaluate everything a player and team does.

Let's consider one example, the Houston Rockets. Utilizing the results of its analytics software, the team rarely shoots long-range two-point jump shots, because the Rockets believe this type of shot is among the worst strategies in basketball. The shots are too far away from the basket to be a high-probability scoring opportunity, yet not far enough (behind the three-point line) to be awarded an extra point for the risk in taking an even longer shot.

Analytics are impacting not only the Rockets, but the entire NBA as well. For instance, in January 2015 NBA data analysis revealed that players attempted more three-point shot attempts than free throws. In fact, three three-point shot defines the shift to analytics in the NBA. It is not a coincidence that the Golden State Warriors, the 2015 NBA champions, were the league's best three-point shooting team during the regular season.

Sources: Compiled from "NBA Teams That Have Analytics Department," *NBAStuffer.com*, August 17, 2015; T. Ross, "Welcome to Smarter Basketball," *The Atlantic*, June 25, 2015; K. Mehta, "Data and the NBA: A Slam Dunk Approach to Basketball," *umbel.com*, June 22, 2015; C. Benjamin, "The 4 Fallacies of NBA Analytics," *Men's Journal*, June 3, 2015; S. Hammer, "Analytics Key to Modern NBA Success," *The Miscellany News*, May 6, 2015; M. Lawrence, "Big Data's Air-Ball: Five Questions about Players that NBA Analytics Can't Answer," *Forbes*, February 27, 2015; B. Alamar, "The Inside Man: NBA Analytics," *ESPN.com*, February 25, 2015; M. McClusky, "This Guy's Quest to Track Every Shot in the NBA Changed Basketball Forever," *Wired*, November, 2014; T. Moynihan, "The NBA's New High-Tech Control Center Is a Hoops Fan's Dream," *Wired*, October 28, 2014; R. Simmons, "Golden State Warriors at the Forefront of NBA Data Analysis," *SFGate*, September 14, 2014; B. Holmes, "New Age of NBA Analytics: Advantage or Overload?" *The Boston Globe*, March 30, 2014; D. Oliver, "How Numbers Have Changed the NBA," *ESPN.com*, November, 15, 2013; www.nba.com, accessed August 25, 2015.

Closing Case 11.2 United Parcel Service Uses Three Types of Analytics

The Problem

United Parcel Service (UPS; www.ups.com) is a global organization, with 424,000 employees and nearly 100,000 vehicles. UPS drivers typically make between 120 and 175 “drops” per day. Between any two drops, drivers can take a number of possible paths. With 55,000 routes in the United States alone, the total number of possible routes is inconceivably vast. Clearly, it is in the best interest of UPS and its drivers to find the most efficient routes. Therefore, any tiny amount of efficiency that can be gained in daily operations yields significant improvements to the company's bottom line. Essentially, “little” things matter a great deal to UPS.

In addition, UPS must manage a low-margin business as well as a unionized workforce that is compensated at the high end of the industry scale. Significantly, rival FedEx (www.fedex.com) uses independent contractors for its ground network. Consequently, FedEx does not have the burden of expensive employee benefits packages.

Another problem for UPS is that the increase in electronic commerce has shifted an increasing number of UPS's delivery stops from retailers to residences. In fact, UPS expects that residential deliveries will make up half of the company's total deliveries by 2018. Historically, drivers would drop off multiple packages at a retailer. Today, they must make scattered stops to drop off packages at individual houses in a neighborhood. This process involves more routes and is more time consuming.

The Solution

For decades UPS has been using three types of analytics to produce efficiencies:

- Descriptive analytics asks, “Where are we today?”
- Predictive analytics asks, “With our current trajectory, where *will* we be tomorrow?”
- Prescriptive analytics asks, “Where *should* we be tomorrow?”

As UPS has moved from descriptive to predictive to prescriptive analytics, its data needs have increased, the skill set of its people has increased, and the business impact of analytics has increased. We consider these developments below.

Descriptive Analytics.

UPS implemented descriptive analytics in the 1990s when the company provided its drivers with hand-held computers, called Delivery Information Acquisition Devices (DIADs). The DIADs enabled UPS to capture detailed data that measured the company's current status. For example, the company measured driving variables in hundredths of a second. Their reasoning was that if they could reduce one mile per driver per day in the United States alone, that process would add up to \$50 million to the bottom line annually.

One drawback to the DIAD system was that the data were scattered across various locations. Specifically, some of the data were with employees, some were located in corporate repositories, some were contained in Excel spreadsheets, and some were distributed throughout the company. However, UPS did not have a predictive model that could help the company “tomorrow.”

Predictive Analytics.

To address this problem, in 2003 UPS deployed predictive analytics with its Package Flow Technologies system. With this system, drivers started the day with a DIAD that detailed the packages they were to deliver and the order in which they were to deliver those packages. The DIAD became the drivers' assistant. The system enabled UPS to reduce total delivery driving by 85 million miles per year. That process saved the firm 8.5 million gallons of fuel, and it saved the planet from 85,000 metric tons of carbon dioxide going into the atmosphere.

However, drivers had to provide different services from the same vehicle—for example, deferred service and premium service. They had some packages that had to be delivered by 10:30 AM, some that had to be delivered by noon, and some that had to be delivered by 2:00 PM. Drivers therefore had to decide how they were going to service those customers. With so many variables to consider, it was practically impossible for drivers to optimize their routes.

Prescriptive Analytics.

UPS realized that it needed to take analytics to the next level. So, in mid-2012, the company began deploying its On-Road Integrated Optimization and Navigation (ORION) system. ORION reorganizes the drivers' routes based on today's customers, today's needs, and today's packages, and it designs deliveries in a very specific, optimized order. ORION takes into account UPS business rules, maps, what time drivers need to be at specific locations, and customer preferences.

When UPS drivers are on the road, they usually travel at speeds of 20-25 miles per hour. Therefore, every mile reduced equates to a savings of 2-3 minutes. Because ORION shortens routes by 7-8 miles per day, this savings enables UPS to deliver more packages.

ORION enhances UPS customer service with more efficient routing, and it allows UPS to offer innovative services and customized solutions. An example of this type of service is UPS My Choice, which gives customers a one-day alert for the time a package is arriving, and allows them to control the timing and location of the delivery. By mid-2015, UPS My Choice had almost 13 million members.

At the beginning of a shift, a UPS driver checks his DIAD, which displays two possible delivery routes. One route uses ORION, and the other uses UPS's traditional combination of work rules, procedures, and analytic tools. Drivers can choose either route, but if they decide not to use ORION, then they will be asked to explain their decisions. Driver reaction to ORION has been mixed. The experience can frustrate some drivers who might not want to surrender their autonomy or who might not follow ORION's logic in designing their routes.

The Results

In 2013, ORION saved 1.5 million gallons of fuel (on top of the 8.5 million gallons the firm was already saving). UPS gained those savings despite the fact that only 20 percent of its 50,000 drivers had adopted the system. UPS plans to complete the deployment of ORION by the end of 2016. When ORION is fully implemented, the system is expected to reduce the distance driven by its drivers by 100 million miles annually. Further, ORION will produce annual savings of \$300 million as well as an additional 10 million gallons of fuel. In addition, ORION will produce further environmental benefits and cost reductions when UPS vehicles outside the United States are equipped with the technology.

UPS continues to look into the future. Interestingly, ORION provides a natural link to driverless vehicles.

However, ORION does not yet perform certain functions. For example, when drivers leave in the morning, the route they have in their DIAD does not change, meaning the system does not

update routes if something goes wrong. In addition, ORION also does not take traffic or weather into account. UPS plans to integrate these features into subsequent upgrades of ORION.

Sources: Compiled from C. Powers, “How UPS Augments Its Drivers’ Intuition with Predictive Analytics,” *ASUG News*, June 9, 2015; E. Siegel, “Predictive Analytics Driving Results, ROI at UPS,” *Data Informed*, June 1, 2015; E. Siegel, “Wise Practitioner—Predictive Analytics Interview Series: Jack Levis of UPS,” *Predictive Analytics World*, April 28, 2015; J. Berman, “UPS Is Focused on the Future for Its ORION Technology,” *Logistics Management*, March 3, 2015; “UPS Moves Up Full ORION Rollout in U.S. Market to the End of 2016,” *DC Velocity*, March 2, 2015; J. Gidman, “Algorithm Will Tell All UPS Trucks Where to Go,” *Newser*, February 17, 2015; S. Rosenbush and L. Stevens, “At UPS, the Algorithm Is the Driver,” *The Wall Street Journal*, February 16, 2015; J. Dix, “How UPS Uses Analytics to Drive Down Costs,” *Network World*, December 1, 2014; K. Noyes, “The Shortest Distance Between Two Points? At UPS, It’s Complicated,” *Fortune*, July 25, 2014; www.ups.com, accessed August 26, 2015.

Concept Check Question 11.01

Which of the manager’s roles do modern information systems support?

- ☐ Interpersonal Roles
- ☐ Informational Roles
- ☐ Decisional Roles
- ☒ All of these

Which of the following is not a reason that managers need IT support?

- ☐ Decisions must typically be made under time pressure.
- ☐ Decision makers are often based in different locations.
- ☐ Managers increasingly need to access remote information sources.

- ☒ The number of alternatives is decreasing.
- ☐ Decisions are becoming more complex.

Characteristics of an organizational decision support system include which of the following?

- ☐ affects several organizational units or corporate problems
- ☐ cuts across organizational functions or hierarchical layers
- ☐ involves computer-based technologies
- ☐ integrates with enterprise-wide information systems
- ☒ all of the above

___ refers to applications and technologies for consolidating, analyzing, and providing access to vast amounts of data to help users make better business and strategic decisions.

- ☐ Expert systems
- ☐ Geographical information systems
- ☒ Business intelligence
- ☐ Transaction processing systems

- ☐ Functional area information systems

___ are computer-based information systems that combine models and data in an attempt to solve semistructured and some unstructured problems with extensive user involvement.

- ☐ Dashboards
- ☐ Expert systems
- ☐ Functional area information systems
- ☒ Decision support systems
- ☐ Group decision support systems

Business intelligence applications include:

- ☐ Microsoft Excel spreadsheets
- ☐ Data warehouses
- ☐ Special purpose analytic packages
- ☒ All of these

Searching for valuable business information in a database, data warehouse, or data mart refers to ___.

- ☐ expert system queries
- ☒ data mining
- ☐ database queries
- ☐ query by example
- ☐ structured queries

DSS characteristics include which of the following?

- ☐ support managers at all organizational levels
- ☐ support all phases of the decision making process
- ☐ adaptable to changing conditions
- ☐ usually utilize quantitative models
- ☒ all of the above

___ is the study of the impact that changes in one or more variables of a decision-making model have on other variables.

- ☐ What-if analysis

- ☐ Simulation
- ☐ Statistical analysis
- ☒ Sensitivity analysis
- ☐ Goal-seeking analysis

This information system uses data visualization technologies to analyze and display data in the form of digital maps for planning and decision making purposes.

- ☐ Dashboard
- ☒ Geographical information system
- ☐ Global positioning system
- ☐ Decision support system
- ☐ Transaction processing system

Which capability of digital dashboards enables users to go into greater detail?

- ☒ Drill down
- ☐ Exception reporting
- ☐ Status access

- ☐ Key performance indicators
- ☐ Trend analysis

An important trend is the combination of geographical information systems with ____ to form geospatial technologies.

- ☐ neural networks
- ☐ decision support systems
- ☐ expert systems
- ☐ dashboards
- ☒ global positioning systems

Q 11.22:

With the emergence of technology, current BI focuses more on the use of 
real-time
data.

Q 11.23:

What kind of role does a manager NOT perform under Mintzberg's definition of a decision maker?

• 

- ☐ A

programming

•

- ☐ B

interpersonal

•

- ☐ C

decisional

•

☐ D

informational

Q 11.24:

What dashboard capability would show requirements for the success of a business?

• ✖

☐ A

TAs

• ✔

☐ B

CSFs

•

☐ C

GPS

•

☐ D

ERs

Q 11.25:

Compared to KPIs, CSFs involve data that is more qualitative.

Q 11.26:

Productivity is defined as the ratio of

• ✖

☐ A

supply to demand of all products.

•

☐ B

a company's stock price to amount of capital.

• ✔

☐ C

inputs to outputs of an employee.

•

☐ D

a company's income to expenses.

11.27:

What role would be classified as interpersonal rules performed by a manager?

• ✖

☐ A

monitor

•

☐ B

entrepreneur

•

☐ C

negotiator

• ✔

☐ D

figurehead

Q 11.28:

What phases did Simon describe for decision making?

• ✗

☐ A

plan, devise, execute

•

☐ B

plan, analyze, evaluate

• ✓

☐ C

intelligence, design, choice

•

☐ D

input, process, output

Q 11.29:

An example of a structured decision made by a manager would be

• ✓

☐ A

a budget analysis.

•

☐ B

a neural network.

• ✗

☐ C

a negotiation.

•

☐ D

product research and development.

Q 11.29:

An example of a structured decision made by a manager would be

• ✓

☐ A

a budget analysis.

• ☐ B

a neural network.

• ✗

☐ C

a negotiation.

• ☐ D

product research and development.

Q 11.30:

Structured solutions to problems are more standardized than unstructured solutions.

An organizational transformation with BI should be used if the business

wants a new model to be supported by BI.

Q 11.32:

Unlike BI, data mining explains to managers why a thing has happened.

Q 11.33:

What type of decision making would be appropriate for a long-range goal?

• ✗

☐ A

management control



☐ B

strategic planning

•

☐ C

operational control

•

☐ D

IS support

Q 11.34:

Decisions become more complex as uncertainty about the business

environment

increases.

Q 11.35:

1-800-CONTACTS uses dashboards to monitor their

• ✓

☐ A

customer service agents.

•

☐ B

supply chain.

•

☐ C

information exchange between departments.

•

☐ D

customers.

Q 11.36:

An enterprisewide BI is created through a(n)

•

☐ A

database.

• ✗

☐ B

data mart.

•

☐ C

data table.

• ✓

☐ D

data warehouse.

What is the result of finding information in large databases?

data mining

Q 11.38:

Why do managers need IT support in relation to making decisions?



☐ A

Most decisions are made under time pressure.



☐ B

The number of decision alternatives are minimal.



☐ C

There is decreased uncertainty with decisions.



☐ D

Decisions involve different people.

Q 11.39:

An organizational transformation with BI is different from an enterprisewide BI because it involves _____ business model.



☐ A

creating a new



☐ B

adding to the same



☐ C

modifying the same



☐ D

keeping the same

Q 11.40:

The use of data usage patterns from phones is common in _____ but not in data mining.

☐ A

GIS

• ✓

☐ B

reality mining

• ✗

☐ C

dashboards

☐ D

real-time BI

Q 11.41:

The ratio of inputs to outputs of a manager can be thought of as

☐ A

efficiency.

• ✓

☐ B

productivity.

☐ C

reliability.

☐ D

certainty.

Business Analytics

- Developing actionable decisions or recommendations for actions based on data
- Examine data with with tools and techniques
- Formulates descriptive, predictive, and prescriptive models

- Communicates results to decision makers

Business Intelligence (BI)

- Applications, technologies, and processes
- Used for gathering, storing, accessing, and analyzing data
- To help make better decisions

Management

- a process by which an organization achieves its goals through the use of resources
- people
- money
- materials
- information

Productivity

Efficiency: ratio between the inputs and outputs, performing or functioning in the best possible manner with the least waste of time and effort.

Effectiveness: the degree to which something is successful in producing a desired result

Decision

- A choice among two or more alternatives that individuals and groups make.
- Decisions are diverse and are made continuously.
- Decision making is a systematic process.

The Manager's Job and Decision Making

- Management
- Productivity
- Three Basic Roles of Managers
- Decision
- Four Phases of Decision Making

Three Basic Roles of Managers

- Interpersonal Roles
- Informational Roles
- Decisional Roles

The Process and Phases in Decision Making

Intelligence phase: What is the problem? (Examination)

Design phase: What are my options? (Validation of the model)

Choice phase: Pick an option and decide how to implement it (Verification, testing of proposed solution)

Implementation of Solution, did this option worked as proposed?

Why Managers Need IT Support

- The number of alternatives is constantly increasing
- Most decisions are made under time constraints
- Increased uncertainty requires sophisticated analyses
- Group decision making required

Computerized Decision Analysis Framework

Managerial decisions categories

Operational Control: executing specific tasks efficiently and effectively.

Management Control: acquiring and using resources efficiently in accomplishing organizational goals.

Strategic Planning: the long-range goals and policies for growth and resource allocation

Database are arranged so that one set of software programs – the database management system – provides all users with access to all data

Database Management Systems (DBMS) maximize the following:

- Data security: Databases must have extremely high security measures in place to deter mistakes and attacks since data is stored in one place.
- Data integrity: Data must meet certain constraints, such as no alphabetic characters in a Social Insurance Number field.
- Data independence: Applications and data are not linked to each other (kept separate or independent by the DBMS that controls access), so that all applications are able to access the same data.

Field: A logical grouping of related characters

Record: A logical grouping of related fields

File (or table): A logical grouping of related records

Database: A logical grouping of related files

Database management system (DBMS) creates and manages a database

Relational database model is based on concept of twodimensional tables

DESIGNING THE DATABASE

Data model is a diagram that represents the entities in the database and their relationships

- Entity is a person, place, thing, or event about which an organization maintains information. A record describes an entity.
- Instance is one specific, unique representation of the entity.
- Attribute is a characteristic or quality of a particular entity
- Primary key is a field that uniquely identifies a record. Note that every record MUST have a primary key.
- Secondary keys are other identifying fields that typically do not identify the file with complete accuracy.
- Foreign key field(s) are used to uniquely identify a row of another table that is linked to the current table

BIG DATA

- Data is being collected at an increasingly rapid pace from many sources
- New types of data are being collected
- Organizations and individuals must process that data
- Worldwide, IDS reports that data is increasing by 50% per year
- BIG DATA = data so large and complex it cannot be managed by traditional systems

CHARACTERISTICS OF BIG DATA

Volume: computer-generated from many sources

Velocity: flows rapidly to/from within the organization

Variety: in addition to numbers and text, it includes images, sound, webbased content and others

ISSUES WITH BIG DATA

Sources can include:

- Untrusted sources, e.g. emails, social media, call centers
- Data could be “dirty,” i.e. inaccurate, incomplete, incorrect, duplicate or erroneous (e.g. incorrect spelling)
- Big data changes since quality issues can arise during collection that are temporary or permanent (e.g. due to equipment failure)

Deciding what needs to be done is the most important task – what is the information gap or problem? For example:

- Spot business trends more rapidly and accurately
- Prevent the spread of disease
- Track crime

Then, the organization needs to move from traditional processing to Big Data processing:

- Integrate information silos into a database environment
- Develop data warehouses to access multiple databases or long term data

DATA WAREHOUSES AND DATA MARTS: CHARACTERISTICS

- Organized by business dimension or subject
- Use On-line Analytical Processing
- Integrated
- Time Variant
- Nonvolatile
- Multidimensional

DATA INTEGRATION ETL: extract, transform, load

- To extract data from source systems, transform them, and load them into a data mart or warehouse.
- Can be performed by hand-written code (e.g., SQL queries) or by commercial data integration software.
- Can be transformed to make them more useful.

STORING THE DATA .

- The most common architecture is one central enterprise data warehouse, without data marts, called “a single version of the truth.”
- Independent data marts, which store data for a single or a few applications, such as in marketing or finance.

- Hub and spoke stores data in a central data warehouse while simultaneously maintaining dependent data marts that obtain their data from the central repository. This helps to maintain a single view of the data since it is centrally organized.
 - Metadata is Data about data.
 - Data Quality: The quality of the data in the warehouse must be adequate to satisfy users' needs
 - Governance requires that people, committees, and processes be in place to plan and control the development and use of the data warehouse.
 - Users: There are a large number of potential BI users, including IT developers; front-line workers; analysts; information workers; managers and executives; and suppliers, customers, and regulators.

Knowledge management (KM): a process that helps organizations manipulate important knowledge that is part of the organization's memory

Knowledge: information that is contextual, relevant, and useful, developed with the assistance of expertise, also known as Intellectual capital (or intellectual assets)

Explicit knowledge: objective, rational, technical knowledge that has been documented. • Examples: policies, procedural guides, reports, products, strategies, goals, core competencies

Tacit knowledge: cumulative store of subjective or experiential learning. • Examples: experiences, insights, expertise, know-how, trade secrets, understanding, skill sets, and learning
Knowledge management systems (KMSs) use modern information technologies to systematize, enhance and expedite knowledge management, with the goal to make the most productive use of knowledge

Best practices (effective and efficient ways of doing things) are an example of knowledge that can be managed with the assistance of a KMS

Fundamentals of Relational Database Operations

- Query Languages: search for information in databases or data warehouses
- Normalization: optimize the tables in a relational database
- Joins: link relational database tables with common attributes

QUERY LANGUAGES: SQL (Structured Query Language)

Typical key words include:

- SELECT – what to locate
- FROM – specify the source files
- WHERE – provides conditions for the search, like an “if” statement
- For example, these statements could be combined as follows: SELECT Student_Name FROM Student_Database WHERE GPA>=3.40 and GPA<3.60

QUERY LANGUAGES: QBE (Query by Example)

- Uses a form (template) to provide a sample or description of the desired information
- Drag and drop features of DBMS such as Microsoft Access enable easy completion of QBE forms

ENTITY-RELATIONSHIP (E-R) MODELING

- Database designers plan the database design in a process called entityrelationship (ER) modeling.
- ER diagrams consists of entities, attributes and relationships organized using business rules.
- Business rules describe how the organization uses its data to run its operations
- Entities are shown as rectangles, with relationships shown on the lines between them

E-R Modeling Terms

Degree of relationship: how many linkages?

- Unary: single entity
- Binary: two related entities
- Ternary: three related entities

Relationship classifications

- One-to-one (1:1): e.g. student : parking permit
- One-to-many (1:M): e.g. professor : class
- Many-to-man (M:M) e.g. students : classes

NORMALIZATION

- A method for analyzing and reducing a relational database to its most streamlined form
- Purpose is to provide minimum redundancy (minimize duplicated attributes)
- Focus is to reduce non-key attributes
- Improves processing efficiency of the database
- Functional dependencies express how attributes are associated (e.g. every pizza order needs a date) and need to be retained during normalization

What is the main purpose of material planning processes?

☐

a.

Generate cost reduction

☐

b.

Optimize enterprise performance

☐

c.

Enhance production

☐

d.

Improve product quality

☒

e.

Combine the supply of materials with the demand

What is not a benefit of Web services?

- ☐
- a.
Ability to apply without modifying underlying applications.
- ☐
- b.
Lower costs than integration projects.
- ☐
- c.
Integrates multiple client-server systems.
- ☒
- d.
Decreased accessibility.

What steps are involved in the accounting portion of the procurement process?

- ☐
- a.
Creating and sending the purchase order
- ☐
- b.
Creating the purchase requisition and sending payment
- ☐
- c.
Creating the purchase requisition and receiving the materials
- ☒
- d.
Receiving the invoice and sending payment
- ☐
- e.
Receiving the materials and the invoice

Which of the following activities is not related to the fulfillment process?

- ☐
- a.
Prepare Shipment
- ☐
- b.
Ship to Customer
- ☐
- c.
Locate Materials



d.
Prepare for Storage

To secure that cross-functional processes are executed smoothly among several departments, two things are essential:



a.
A certified specialist.



b.
Effective communication and collaboration.



c.
Time and resources.



d.
Clear guidance from the management.



e.
Equipments and Systems.

One specific expression summarizes an important skill to enable employees to improve their process perspective. Which of the following expressions is it?



a.
"The more the better."



b.
"Time is money".



c.
"Think sideways".



d.
"Tomorrow is too late"



e.
"Less is more."

Which type of data represents entities associated with various processes?



a.
Material types Data.



b.
Master Data



c.
Basic Data



d.
Material Data



e.
MRP Data

Which of the following SAP systems are used to support inter-company processes?



a.
Strategic enterprise management (SEM) module



b.
Materials management (MM) module



c.
Production planning (PP) module



d.
SAP SCM

What is the first step of the asset management process?



a.
Issue invoice



- b.
Request maintenance
☐
- c.
Receive Finished Goods
☐
- d.
Authorize Production
☐
- e.
Create Product

Which of the following process is related to design and development of products?

- ☐
- a.
Asset management and customer service processes
☐
- b.
Project management processes
☐
- c.
Production process
☐
- d.
Material planning process
☒
- e.
Lifecycle data management process

Which of the following is not a component of the procurement process?

- ☐
- a.
Accounting
☐
- b.
Purchasing
☒
- c.
Sales



d.
Warehouse

Which of the following are examples of Business Processes?



a.
All of these.



b.
Collecting sales tax.



c.
Managing cash receipts.



d.
Processing bills of material.



e.
Applying healthcare benefits.

The goals of business process reengineering do not include:



a.
Reduce waste.



b.
Increase productivity.



c.
Increase customer satisfaction.



d.
Optimize operations.



e.
Increase cycle time.

What differentiates a single functional process to a cross-functional process?



a.

The second one interferes with entire organization, while the first one is concentrated on a single functional area.



b.

The first one has a clear owner, while the second one has no single owner responsible for process execution.



c.

The level of automation of a process.



d.

The number of complexities a process has.

A ____ is a collection of related activities that produce a product or a service of value to an organization.



a.

business process



b.

information system



c.

management technique



d.

workflow pattern



e.

supply chain

Which term is generally used to describe the ways that users can view and analyze data to help them make decisions and complete their tasks?



a.

Period Definition

- ☐
- b. Evaluating
- ☐
- c. Characteristics
- ☒
- d. Reporting
- ☐
- e. Online Analytic Processing (OLAP)

Which term relates to the technical capabilities that allow systems to connect with one another through standardized interfaces called Web services?

- ☐
- a. Customer Relationship Management
- ☐
- b. Architecture
- ☐
- c. Supply Chain Management
- ☒
- d. Service-Oriented Architecture
- ☐
- e. Enterprise Resource Planning

What part of the various functional areas is NOT also a part of the project management process?

- ☒
- a. None of the above
- ☐
- b. Budgeting

- ☐
- c.
Settlement
- ☐
- d.
Execution
- ☐
- e.
Planning

Why is it appealing to shift towards a three-tier client-server architecture?

- ☐
- a.
More difficult to support a greater number of users overtime.
- ☐
- b.
Low maintenance complexity
- ☒
- c.
Significant cost reduction
- ☐
- d.
Easy to implement

What function does the warehouse perform in the fulfillment process?

- ☒
- a.
Prepare and sends the shipment to the customer
- ☐
- b.
None of the above
- ☐
- c.
Tracks the order
- ☐
- d.
Communicates data related to the order to other parts of the organization
- ☐
- e.

Notifies the customer

The best known framework for analyzing competitiveness is?

☐

a.
Competitive globalization model.

☐

b.
Freidman's ten flatteners.

☐

c.
Michael Porter's value chain model.

☒

d.
Michael Porter's competitive forces model.

The traditional IT department:

☐

a.
spends very little on IT infrastructure.

☒

b.
owns their hardware, software, and networks.

☐

c.
None of these

☐

d.
stores all their data off-premise.

As IT is a continuous growing area, it cannot support all major business pressures currently. Therefore, IT solutions so far are only able to support technological pressures and partially economic pressures.

☐

a.
True

☒

b.
False

The use of network standards to connect different types of computer networks resulted in _____.



a.
local area networks



b.
cloud computing



c.
enterprise computing



d.
mobile computing

What is the main advantage provided by a hybrid cloud?



a.
Cost efficiency



b.
Lower level of complexity.



c.
Higher security levels.



d.
Optimized performance.



e.
Lower vendor dependency, since infrastructure is connecting two or more different clouds.

Which are concerns with cloud computing?

☐

a.
Reliability

☐

b.
Privacy

☐

c.
Criminal use of cloud computing

☒

d.
All of the above.

With the advancement of 3D printers, a new term emerged. Which of the terms and explanations below are properly matched:

☐

a.
Additional manufacturing, since 3D printers add several layers using a variety of inputs while producing an object.

☒

b.
Additive manufacturing, since 3D printers gradually produce layers of material while producing an object.

☐

c.
Computer-aided design (CAD), since 3D printers are production models that are aided by design softwares.

☐

d.
Computer-integrated manufacturing (CIM), because 3D printers enable real integration of softwares and manufacturing processes.

Open-source software is less reliable than proprietary software.

☐

a.
True

☒

b.
False

CRM systems have gained a lot of notoriety due the need of companies to know their customers better to anticipate their needs. An important component of CRM is a process called:

- ☐
- a.
Customer Satisfaction
- ☐
- b.
Advertising
- ☐
- c.
Customer Loyalty
- ☒
- d.
Purchasing habits

What is not a main issue with on-premise computing infrastructure?

- ☐
- a.
Cost of expert staffs.
- ☒
- b.
Always ahead of market standards.
- ☐
- c.
All of the above are issues with on-premise computing infrastructure.
- ☐
- d.
Cost of physical facilities.
- ☐
- e.
Need for constant staff training.

Which of the following is not an input device?

- ☐
- a.
Keyboard
- ☐

- b.
Camera
☐
- c.
Touch screen
☒
- d.
Monitor

A global economy and increasingly stronger competitors are important market pressures faced by firms. Therefore, what would be an IT alternative to address such pressures?

- ☐
- a.
None of the above.
☐
- b.
Optimize hardware infrastructures.
☐
- c.
Become 100% cloud company.
☒
- d.
Enhance Electronic Commerce.

The decision to invest in the latest computer hardware is:

- ☒
- a.
largely dependent on the industry the company operates in.
☐
- b.
always a good idea.
☐
- c.
the only way to stay competitive.
☐
- d.
All of these

What are the integrated components of information systems inside an organization?

☐

a.

IT Infrastructure; IT Components; IT Helpdesk; Business Intelligence Systems; ERP; Transaction Processing Systems.

☐

b.

IT Personnel; ERP; Transaction Processing Systems; IT Infrastructure; IT Services.

☒

c.

Business intelligence Systems; ERP; Transaction Processing Systems; IT Infrastructure.

☐

d.

IT Components; IT Personnel; IT Services; ERP; Business Intelligence Systems.

CPUs can process only _____ data.

☒

a.

binary

☐

b.

numerical

☐

c.

encrypted

☐

d.

alphabetical

Enabling groups to work together in ways that were not available previously is called:

☐

a.

reducing costs.

☐

b.

mining insights from data.

☐

- c.
making individuals more productive.
☒
- d.
facilitating collaboration.

As a general understanding it is correct to say that cloud computing is increasing its relevance due to the fact that companies are reaching full capacity of their infrastructure and do not want to invest in new on-premise infrastructure.



- a.
False
☐
- b.
True

Which of the following is classified as cloud computing?



- a.
Office 365
☐
- b.
Google Docs
☐
- c.
Dropbox
☒
- d.
All of these

According to Potter's value chain model, which of the following can be considered "Primary Activities"?



- a.
Production Control
☐
- b.

None of the above



c.

Procurement



d.

Product engineering

In comparison with primary memory, secondary storage is understood to be, cheaper, slower to retrieve data and easier to connect with other media.



a.

False



b.

True

The concept of multimedia technology refers to a group of computers connecting.



a.

True



b.

False

The term "digital divide" refers to the gap between:



a.

Both of the following: Individuals who have access to information and communication technologies and those who do not; and the IT staff and the other employees who are not IT savvy.



b.

Organizations that utilize wireless technologies and those that do not.



c.

The IT staff and the other employees who are not IT savvy.

☐

d.

Both of the following: Organizations that utilize wireless technologies and those that do not; and individuals who have access to information and communication technologies and those who do not.

☒

e.

Individuals who have access to information and communication technologies and those who do not.

Configured mass customization is a strategy in which companies provide standard specifications for different consumer groups. Examples of it can be found in industries such as cars, smartphones, clothing manufacturers among others.

☐

a.

True

☒

b.

False

In a service-oriented architecture (SOA), web services can be reused across an organization in other applications.

☐

a.

False

☒

b.

True

It is legal to make multiple copies of copyright software as long as you paid for one copy.

☐

a.

True

☒

b.

False

If a programmer wants to develop a good software, which of the attributes below is the least important to focus on?

☐

a.
Reliable

☐

b.
Defect-free

☐

c.
Cost-effective

☒

d.
Appearance and Style

Which of the following contribute(s) to the new challenges for organizations to manage how their employees work?

☐

a.
Prevalent Internet connectivity

☐

b.
Personal portable devices

☒

c.
All of these

☐

d.
A mobile workforce

Source-data automation uses various technologies to input data with needed human intervention.

☒

a.
False

☐

b.
True

With the advance of enterprise computing in the early 1990s and cloud computing in the new millennium, old types of computing resources were abandoned.



a.
False



b.
True

Which of the following can be considered a human data-entry device?



a.
Printer



b.
Joystick



c.
Microphone



d.
Cameras



e.
Optical mark reader

DSS characteristics include which of the following?



a.
support all phases of the decision making process



b.
adaptable to changing conditions



c.
support managers at all organizational levels



d.

usually utilize quantitative models



e.

all of the above

Public data that individuals or organizations can use free of charge are known as:



a.

Governmental data



b.

opensource data



c.

open data



d.

experimental data



e.

pilot data

Which of the following is not a reason that managers need IT support?



a.

Decisions are becoming more complex.



b.

Decisions must typically be made under time pressure.



c.

The number of alternatives is decreasing.



d.

Decision makers are often based in different locations.



e.

Managers increasingly need to access remote information sources.

Which capability of digital dashboards enables users to go into greater detail?



a.

Status access



b.

Drill down



c.

Trend analysis



d.

Key performance indicators



e.

Exception reporting

A _____ is a logical grouping of related fields.



a.

record



b.

byte



c.

database



d.

file



e.

field

The two basic operations that Data Mining can perform are:



a.

predicting trends and behaviors AND mining cryptocurrency

- ☒ a. identifying previously unknown patterns AND predicting trends and behaviors
- ☐ b. collecting large amounts of data AND predicting trends and behaviors
- ☐ c. identifying previously unknown patterns AND mining cryptocurrency
- ☐ d. identifying previously unknown patterns AND predicting trends and behaviors

According to the economist Herbert Simon (1977), decision making is composed by the following phases, except:

- ☐ a. Choice
- ☐ b. Design
- ☒ c. Benchmarking
- ☐ d. Intelligence

Operational data that are constantly updated are stored in:

- ☐ a. All of these.
- ☐ b. data marts.
- ☐ c. data warehouses.
- ☒ d. databases.

___ are computer-based information systems that combine models and data in an attempt to solve semistructured and some unstructured problems with extensive user involvement.



a.
Group decision support systems



b.
Decision support systems



c.
Dashboards



d.
Functional area information systems



e.
Expert systems

An important trend is the combination of geographical information systems with ___ to form geospatial technologies.



a.
neural networks



b.
global positioning systems



c.
dashboards



d.
expert systems



e.
decision support systems

Which of these statements regarding business analytics models is incorrect?

☐

a.

Predictive analytics examine recent and historical data to detect patterns and predict future outcomes.

☐

b.

Prescriptive analytics recommends one or more courses of action and shows the likely outcome of each decision.

☐

c.

Descriptive analytics summarize what has happened in the past and allow decision makers to learn from these.

☐

d.

Descriptive analytics examples include reports that provide historical insights on production, financials, operations, and sales.

☒

e.

Predictive analytics is limited to predicting one possible outcome and showing how likely it is to occur.

During the decision making process which of the following process is related to the Design phase?

☐

a.

Testing of proposed solution

☐

b.

Implementation of solution

☐

c.

Selection a solution that seems best suited

☒

d.

Validation of the model

☐

e.

Examination

When customers access a website and make purchases, they generate _____.

- ☐
- a.
Tracking cookies
- ☐
- b.
Information
- ☒
- c.
Clickstream data
- ☐
- d.
Hyperlink data
- ☐
- e.
Web data

_____ is a process that helps organizations identify, select, organize, disseminate, transfer, and apply expertise that is part of the organization's memory and typically resides inside the organization in an unstructured manner.

- ☐
- a.
Data mining
- ☒
- b.
Knowledge management
- ☐
- c.
Discovery
- ☐
- d.
Decision support

Which is not a valid definition of Big Data?

- ☐
- a.
vast sets of data that exhibit variety, include structured, unstructured, and semi-structured data, generated at high velocity, do not not fit traditional databases, and can only be analyzed by sophisticated IS.
- ☐

- b. diverse, high-volume, high-velocity information assets that require new forms of processing to enable enhanced decision making, insight discovery, and process optimization.
☐
- c. a collection of data so large and complex that it is difficult to manage using traditional database management systems.
☒
- d. large amounts of traditional data that can be analyzed through conventional database management systems.

___ is a type of decision that requires a combination of standard solution procedures and individual judgment.

- ☐
- a. Strategic planning decision
☒
- b. Semistructured decision
☐
- c. Unstructured decision
☐
- d. Management control decision
☐
- e. Structured decision

Gorry & Morton (1971) published the "Framework for Management Information Systems" based in two dimensions, which were:

- ☒
- a. Problem structure and nature of decisions
☐
- b. Source of resources and type of impact
☐

- c.
IT management and business objectives
☐
- d.
Problem root-cause and alternatives

Searching for valuable business information in a database, data warehouse, or data mart refers to ____.

- ☐
- a.
expert system queries
☒
- b.
data mining
☐
- c.
database queries
☐
- d.
structured queries
☐
- e.
query by example

Data redundancy refers to:

- ☐
- a.
storing data in a single central location.
☒
- b.
having copies of the same data in multiple locations.
☐
- c.
All of these
☐
- d.
sharing data with others.

A small relational database that contains records and attributes is also usually called as:

- ☒ a.
flat file
- ☐ b.
record file
- ☐ c.
entity
- ☐ d.
data file

One of the benefits of data warehouses and data marts is the fact of being low cost and volatile, enabling easy scalability and flexibility to update data whenever needed.

- ☒ a.
False
- ☐ b.
True

What is the Canadian equivalent of the US Sarbanes-Oxley Act?

- ☐ a.
Bill 190
- ☒ b.
Bill 198
- ☐ c.
Bill 168
- ☐ d.
Bill 193
- ☐ e.
Bill 108

What operation combines records from two or more tables in a database to obtain information that is located in different tables?

- ☒
- a.
Join
- ☐
- b.
Combine
- ☐
- c.
Concatenate
- ☐
- d.
Junction

Characteristics of an organizational decision support system include which of the following?

- ☐
- a.
cuts across organizational functions or hierarchical layers
- ☐
- b.
integrates with enterprise-wide information systems
- ☒
- c.
all of above
- ☐
- d.
involves computer-based technologies
- ☐
- e.
affects several organizational units or corporate problems

In a relational database, the customer record contains information regarding the customer's last name. The last name is a _____ :

- ☐
- a.

entity



b.

object



c.

primary key



d.

attribute



e.

relation

Natural key: we did not make that up, auto generated attribute like ID, ISBN

Surrogate key: we made that up, like authorkey