Chapter 1
Information Systems and You

1. 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. In every information system, simple or complex, there are 5 components.

- Computer Hardware
- Software
- Data
- Procedures
- People

2. What is MIS?

- **Management Information Systems:** development and use of information systems that help organizations achieve their goals and objectives.

  - **Development and Use of Information Systems**

    - Take an *active role* in order to ensure that system will meet your needs
    - Understand how they are constructed
    - Consider the user's needs during development
    - Learn how to employ the system
    - Take into account other important functions (Security, Backup, Recovery).

  - **Achieving Business Goals and Objectives**

    - MIS aids businesses in achieving objectives.
    - MIS empowers users to reach goals and needs to be developed for right reason.

3. How does IS differ from IT?

- **Information technology (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 and how these are networked together.
- **Information system (IS)** is a system of hardware, software, data, procedures, and people that produces information. IS includes people in the equation. Including people in the system impacts how you design and implement systems

  - **IT within IS**

- IT alone will not help an organization achieve goals, it must be embedded into an IS to help accomplish objectives.
- It becomes useful only when the technology within the hardware, software, and data is combined with the people and procedure components IT becomes useful.

4. How important are IS to our economy?

The industry sector most closely related to the development and use of information systems is the Information and Communications Technology (ICT) sector. This sector includes companies involved in:

- Software and computer services
- Cable and other program distributors
- Telecommunications services
- ICT manufacturing
- ICT wholesaling.

5. How do successful Business Professionals use IS?

- **Every business professional uses numerous information systems, such as:**
- E-mail, Accessing web pages
- Using word processors and spreadsheets, PowerPoint's.
- Cell phones or IM and location-based services on smart phones

- **Business professionals need to expand their knowledge to include the following:**
- Use of mobile devices and applications
- Use of project-management software (Microsoft Project, OpenProject)
- Business graphics (MS Visio, SmartDraw)
- Collaborative systems (Google Docs)

- **To gain a competitive advantage:**

- Developing a technology is not necessary, but thinking creatively about problems, challenges, and opportunities in business and organization is of essence.

6. What is the shape of things to come?

- **Moore's Law:** The density of circuits on an integrated chip doubles approximately every two years or so. This prediction has been generally accurate for more than 40 years. The cost of computers has declined over the past 55 years.

- **How will IT and IS affect the way we live and work?**

- According to **Hal Varian**, business people need a better understanding of how IT can be used to support innovation. Mobility devices will change what it means to go to work, work will come to you, wherever you are, and you will deal with your work at any time and any place using the networks that have become so readily available.

- **David Ticoll** suggested that within the next decade:
  - Unlimited storage will be almost free and analytical software will reveal hidden treasures
  - The real and virtual world will collide as wide-area networks become cheap, reliable, and widely available
  - These technology trends will enable deep, powerful, performance-enhancing innovations that will be felt in almost every industry

Changes that will occur

- Increased ease of use of IT
- Decrease in costs of IT
- Sunk costs & commitment
- Decrease in size of devices
- Increase in availability
- Increase in adoption of location based services
- Impact of mobile devices
- Ability to handle data
- Impact of shifts in technology on businesses

Chapter 2 (PS&I)
Business Processes, Information Systems, and Information

1) What is a business process?

Business process: sequence or network of activities (tasks), repositories, roles, resources and data flows that interact to accomplish a business function
They're documented using BPMN (business process management notation), an abstract model that is the global standard for documentation.

- **Roles:** subset of business activities that are performed by an actor (can be a person, computer).
- **Repository:** A collection of something (usually records)
- **Resources**: perform/enable the processes
- **Swimlanes:** separate the various roles in the process model.

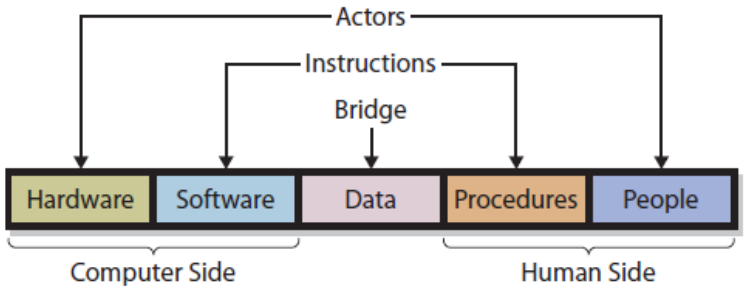
NB: How much detail is enough in the model? Include as many activities as required to avoid ambiguity.

➢ **Benefits of standardized business processes for an organization**:

- They help enforce rules.
- They provide consistent results because regardless of the actor playing a role in the process, the activities and decisions are performed in a consistent manner.
- They allow for scalability; replicate the process and implement it in new areas as an org. grows.
- They reduce risk, i.e. by reducing the potential for error that exists when different employees do things differently.

2) What is an information system?

➢ **System:** Group of components interacting to achieve some purpose.
➢ **Information system**: Group of five components that interacts to produce information.
- Computer hardware
- Software
- Data
- Procedures
- People



Hardware and people play the role of actors and perform certain actions. The software and procedures help determine the instructions on how to do things and the data provides the important bridge between the computer side and the human side.

- Business Processes and Information Systems have different scopes: For instance, a business process may utilize several different information systems, while a single information system can provide information for several different business processes.

3) What is information?

- **Information**
  - Knowledge derived from data, which refers to records or facts.
  - Data presented in a meaningful context
  - Processed/manipulated data
  - A difference that makes a difference

- **Where is Information?**
  - Data is perceived: displayed on the computer side of the information system.
  - Information is conceived: interpreted by the human side of the information system.

4) What factors drive information quality?

- **Data Factors**
- Accuracy
- Timeliness
- Correct granularity (not too detailed, or not too coarse)
- Easiness to use (must be easy to process).

- **Human Factors**
- Knowledge: level of human knowledge influences how we perceive data.
- Criteria: used to sort data to help it make more sense.

- **How do groups conceive information?**
  Shared mental apparatus: humans organize themselves into groups, and tend to perceive data and conceive information the same way. However, there are times when we are in groups that do not perceive data the same. In these cases, there may be one or more members in a group that notice something others do not. This can also serve as an advantage for a group.

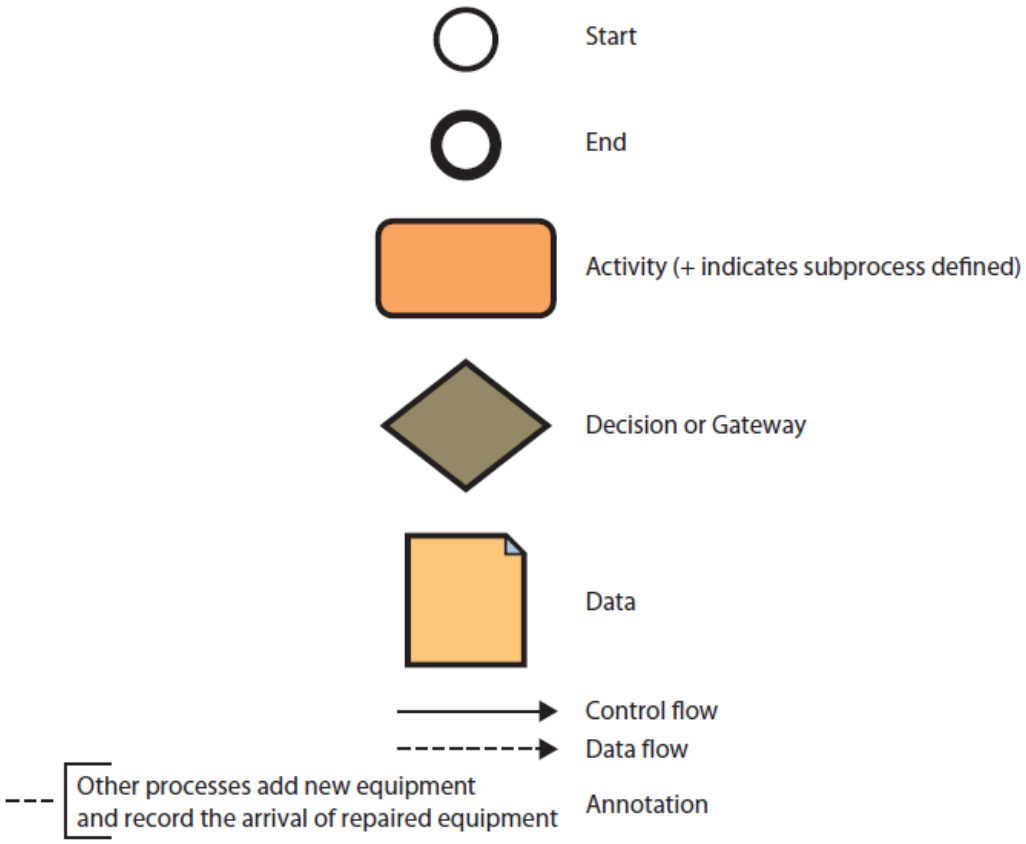
5) How do structured and dynamic processes vary?

- **Structured Processes:** Are standardized processes. They support day-to-day operations.
- More controlled and standardized.
- Efficiency, as well as effectiveness, is emphasized.
- Information systems for structured processes are prescriptive, meaning the information systems used can be rigid to support the structured process.

- **Dynamic Processes:** Are less specific, more adaptive and intuitive, not structured. Effectiveness is of the utmost importance. Information systems are designed to support the processes, not to control them. These types of information systems are often collaborative.

	Structured Processes	Dynamic Processes
	Are formally defined	Are not formally defined
	Support day-to-day operations	Support once in a while operations
	Process change is slow and difficult	Process change is rapid & expected
	Control is critical	Adaptation is critical
	Innovation is not expected	Innovation is expected
	Efficiency & Effectiveness are important	Effectiveness is typically important
	Procedures are prescriptive	Procedures are supportive

Basic BPMN symbols



Control flow: sequence flow.

Business processes, procedures & IS

- A single process can be supported by zero to multiple IS
- A single IS can support 1 to many processes
- A single IS will have a different procedure for every process
- A single process will have a different procedure for every IS

Hierarchy of processes:

PROCESS
↓
ACTIVITY
(a task within a PROCESS)
(performed by resources –both actors or non-actors)
↓
ROLE
(a subset of an activities in a business process
(performed by a specific actor)

Chapter 3
Production, Innovation and Strategy

1. Why should I care about Productivity and Innovation?

- **Labor productivity**: ratio of the Canadian gross domestic product (GDP) over the total paid hours worked by Canadians. It measures the value that Canadian workers generate per hour, and future growth. Increasing productivity is all about working smarter. What will determine a country's level of productivity in the future is the ability of the country to innovate and adapt to changing economic conditions.

- **Productivity paradox:** "We see computers everywhere except in the productivity statistics." Meaning that computers did nothing for productivity even though they were supposed to increase it. This underlines how an innovation can be useless unless people are trained to use it properly.

How Can IT Create Business Value?

IT can be used to create business value through three different ways:

- **Productivity** : IT allows a company to make either more output from the same inputs, and/or to make better output and/or to make the output faster than before the technology
- **Structure of competition**: IT can alter the way corporations compete.
- **Benefits to the End customer**: IT helps make processes more efficient and changes the nature of the competition. Consumer may see cheaper and better goods and services

2. What is Business Technology Management (BTM) and how is it related to Productivity and Innovation?

- **Business Technology Management**: using technology to change the way the world does business.

The ICT industry sector is viewed as an important industry for productivity and **innovation** because it includes technologies that can enhance individual and organizational productivity across many industries. ICT industry sector indirectly supports activities in other industries with tools that make these other industries more productive.

3. How do information systems improve productivity?

- **Increasing Efficiency**: business processes can be accomplished either more quickly or with fewer resources and facilities (or both). **Doing things right** means using just the right amount of resources, facilities, and information to complete the job satisfactorily.

- **Increased Effectiveness**: means that the company considers offering either new or improved goods or services that the customer values. **Doing the Right Things** often requires companies to consider changing their business processes to deliver something new and improved.

- **Value chain** network of value-creating activities, made up of at least one and often many business processes. Composed of Primary activities and Support Activities.
  It helps to understand how information systems increase productivity and it enables the development of more efficient or more effective supporting activities.

➢ **Primary Activities:** activities in which value is added directly to the product. Stages accumulate costs and add value to product. Net result is the total margin of chain. They include:

- Inbound logistics
- Operations
- Outbound logistics
- Marketing and sales
- Service

➢ **Support Activities:** support the primary activities, and contribute indirectly to production, sale, and service. They add value and costs and produce margin that is difficult to calculate. They include the following activities:

- Firm infrastructure
- Human resources
- Technological development
- Procurement

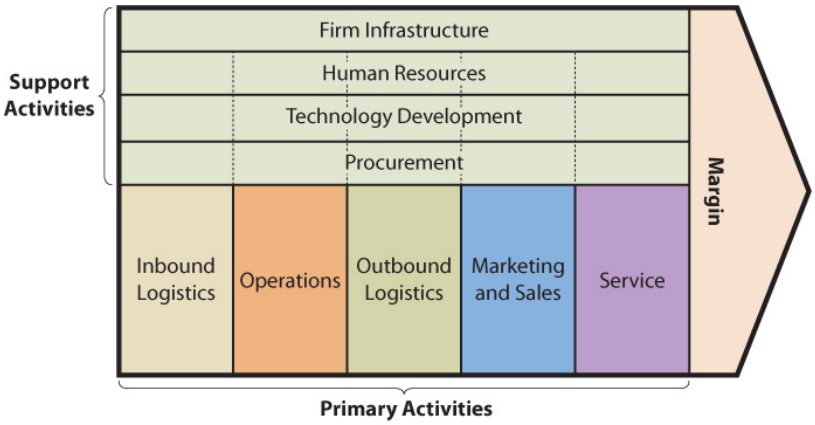


Figure 3-2
Porter's Value Chain Model

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4. How are organizational strategy and industry structure related?

■ **Organizational Strategy:** reflects organization's goals and objectives and is developed from organizational structure. It creates the value chain for organization and establishes the structure, features, and functions of information systems. A company's strategy is influenced by the competitive structure of the industry the company is in.

According to Porter's model, five competitive forces determine industry structure

- ➢ Bargaining power of customers
- ➢ Threat of substitution
- ➢ Bargaining power of suppliers
- ➢ Threat of new entrants
- ➢ Rivalry among existing firms

■ **Competitive Strategy:** Organization's response to structure of its industry. Porter says goals, objectives, culture, and activities must be consistent with strategy and identified four competitive strategies.

- ➢ Cost leadership across industry: lowest cost across the industry.
- ➢ Cost leadership focused on particular industry segment: lowest cost within an industry segment.
- ➢ Differentiation across industry: better product/service across the industry.
- ➢ Differentiation focused on particular industry segment: better product/service within a segment.

5. What is the relationship between innovation and IT?

Bower and Christensen suggested two general types of technology innovations:

- **Sustaining technologies** are changes in technology that maintain the rate of improvement in customer value
- **Disruptive technologies** introduce a very new package of attributes to the accepted mainstream products

➢ **Diffusion of Innovation:** process by which an innovation is communicated through certain channels over time among the members of a social system. Stages of diffusion of an innovation are:

- Knowledge
- Persuasion
- Decision
- Implementation
- Confirmation

6. How do information systems provide competitive advantage?

Organizations respond to the five competitive forces in numerous ways.
Some of these competitive techniques are created via products and services, and some are created via the development of business processes.

Product Implementations
1. Create a new product or service
2. Enhance products or services
3. Differentiate products or services

System Implementations
4. Lock in customers and buyers
5. Lock in suppliers
6. Raise barriers to market entry
7. Establish alliances
8. Reduce costs

Figure 3-8
Principles of Competitive Advantage

■ Competitive Advantage via Products

Organizations gain a competitive advantage by:
- Creating new products or services
- Enhancing existing products or services
- Differentiating their products and services from those of their competitors

➢ Information systems can be part of a product or it can provide support for a product or service, and so, it can achieve these objectives.

■ Competitive Advantage via Business Processes

Organizations can gain a competitive advantage by implementing business systems.

- Locking in customers: Making it difficult or expensive for customers to switch to another product. This strategy is called high switching costs.
- Locking in suppliers: Making it hard to switch to another organization, meaning making it easy to connect to and work with organization.
- Creating entry barriers: make it difficult and expensive for new competition to enter market.
- Establish alliance: with other organizations. They establish standards, promote product awareness and needs, develop market size, reduce purchasing costs, and provide other benefits.
- Reducing Costs: This enables the organization to reduce prices and/or to increase profitability. Increased profitability means not just greater shareholder value, but also more cash, which can fund further infrastructure development for even greater competitive advantage.

7. Can competitive advantage through information systems be sustained?

Does IT really matter?

Competitors often react to innovations by replicating the technology. The more diffused IT becomes, the less competitive advantage information technology provides. However, this doesn't apply to IS which also include organizational procedures and people along with hardware and software.

Sustained Competitive Advantage

- Companies must find a distinctive way to compete.
- Companies must successfully integrate many technology systems with people and procedures in the organization
- While competitors might be able to purchase the technology, it takes time for people to gain the necessary experience and skill. Matching the entire set of information systems is a high barrier for companies with less experience and success in integrating people and technology

The Digital Divide

- Someone who knows how to search the Internet can learn more readily than someone who does not.
- And every year, the person with greater knowledge pulls farther and farther ahead.
- The increasing reliance on the web for information and commerce has created a digital divide between those who have Internet access and those who do not.
- This divide continues to deepen as those who are connected pull farther ahead of those who are not

Chapter 4
Information Technology Components

1. Where did all of this Information Technology come from?

❖ Early Computers: 1939–1952. Large, complex and expensive computers, that requires a single user and runs one program at a time. It was housed at universities.

❖ Mainframes: 1952–Present. First digital computers - large, room-sized devices, mainly used by business and government.

- 1st generation: vacuum tube technology
- 2nd generation: transistors
- 3rd generation: operating systems, multiprocessing

❖ Microcomputers: 1975–Present. Integrated circuits, small microprocessors, monitors, keyboards, portable floppy disks, software.

❖ Networking Personal Computers: 1985–Present.

- Local Area Networks (LANs): link many personal computers together, provide shared access to data, printers, and other peripheral devices.
- Wide Area Networks (WANs): Internet, email, web browsing.

Information Technology Principles

- Price and performance advances
- Small is powerful
- The Network is the thing

2. What does a manager need to know about computer hardware?

- Hardware: consists of electronic components and related gadgetry that input, process, output, and store data according to instructions encoded in computer programs or software

➢ Basic hardware categories: Input, Processing, Output, Storage

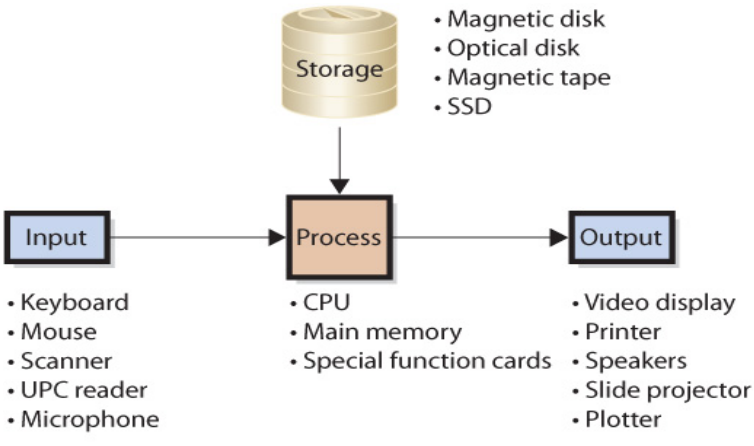


Figure 4-4
Input, Process, Output, and Storage Hardware

Computer Data

- **Binary Digits** (**bits**): Used to represent data, using 0 and 1. Bits are grouped in 8-bit chunks, and are categorized by size.
  - K kilobyte 1024 bytes
  - MB megabyte 1024 K
  - GB gigabyte 1024 MB
  - TB terabyte 1024 GB

How Does a Computer Work?

❖ **CPU (Central Processing Unit)**

- Transfers program or data from disk to *main memory*
- Moves instruction from main memory via *data channel* or *bus*
- Has small amount of very fast memory called *cache* that keeps frequently used instructions

❖ **Computer Components**

- **Main Memory:** Contains program instructions and OS instructions.
  - Memory Swapping: main memory is too small to hold all data. CPU loads programs into memory in chunks. It also places new program into unused memory; if none is available, the operating system will remove chunks being used and replace with requested data.

Why it matters to Managers

➢ Main memory: Too little means constant memory swapping, which slows processing and requires more memory if processing many programs.
➢ CPU: More of it is needed if handling complex tasks.

- Cache and main memory are volatile: Contents are lost when power is off
- Magnetic and optical disks are nonvolatile: Saved contents survive after power is turned off.

3. What is the difference between a client and a server, and what is cloud computing?

❖ **Client computers:** used for word processing, spreadsheets, database access. They connect to servers for Web, e-mail, and database.
❖ **Servers:** provide services. They are faster, larger, more powerful than client computers. They may or may not have video display.

- **Cloud computing**: Customers do not own the computers. The cloud is a metaphor for the Internet, which makes software and data services available from any location at any time. Hardware, software, and applications are provided as a service, through a web browser.

- It builds upon the concept of **grid computing** - several computers are used to address a single problem at the same time. Grid computing uses software to divide and apportion pieces of a program among several computers, sometimes many thousands. Cloud computing adds on the ability to store and access data remotely and to pay for it as a service.

4. What does a manager need to know about software?

There are two types of computer software:

- **Operating System (OS):** program that controls computer's resources
- **Application Programs:** perform specific user tasks

Constraints

- A particular version of an operating system is written for a particular type of hardware.
- Application programs are written to use a particular operating system.

❖ **Four Major Operating Systems**

➢ **Windows:** Used by 85% of the world's desktops and 95% of business users. There are many different versions, the current one being Windows Vista.

➢ **Mac OS:** Have easy-to-use interfaces, used primarily by graphic artists and art community, the current version is Mac OS X.

➢ **Unix:** Developed by Bell Labs, is mostly used by scientific and engineering community. Sun Microsystems is a major vendor of computers employing this operating system. Many Unix users know and employ an arcane language for manipulating files and data.

➢ **Linux:** Version of Unix developed by open-source community of programmers who volunteer to contribute codes to develop and maintain Linux. IBM is a primary proponent, it has developed many business systems solutions that use Linux.

❖ **Owning Versus Licensing**: Users buy licenses to use programs, but ownership ultimately remains with the development company. Except for Linux, which is owned by an open-source community, meaning there is no license fee, and companies make money by offering support

❖ **Types of Application software and How Organizations Obtain Them**

- Application Software consists of programs that perform a business function. Some are general purpose (Excel, Word), and some are specific (QuickBooks- accounting functions).

▪ **Categories of Application Programs**

➢ Horizontal-market application software: Provides capabilities common across all organizations and industries (Word, Excel, PowerPoint, Acrobat, Photoshop, Paint Shop Pro).
➢ Vertical-market application software: Serves the need of a specific industry, usually altered or customized (e.g.appointment scheduling software, tracking system for mechanics).
➢ One-of-a-kind application software: Designed for a specific, unique need (IRS software).
➢ Other (dual-category) application software (CRM software).

▪ **Acquiring Application software**

- Buy off-the-shelf: may be a great fit, or mistake.
- Buy off-the-shelf with alterations
- Custom-developed software: tailor-made for an organization. It may be developed in-house or by outside developer. It can be difficult and risky and staffing and managing teams is challenging.

❖ **What Is Firmware?**

➢ Computer software installed into devices: Printers, print servers, communication devices.
- It is coded like other software but is installed into read-only memory (becomes a part of the device's memory). It can be changed and upgraded

Basic Input/Output System (BIOS): important piece of firmware, used when a computer is initially booted up and is required because all volatile memory is lost when the computer is shut down. The only way to get the computer running again is to provide a set of instructions in non-volatile read-only memory (ROM). The first thing the computer does when starting up is to load BIOS from ROM and run through the commands provided by the firmware. BIOS checks to make sure that the memory and input devices are functional. Once these are working, the operating system will be loaded.

- **Difference between a Thin and Thick Client**

The terms **thin** and **thick** refer to the amount of code that must run on the client computer

- **Thin Client:** an application that requires nothing more than a browser on the client.
- **Thick Client:** an application such as Microsoft Outlook that requires programs other than a browser on the user's computer.

5. What buying decisions do you need to make?

Manager's role depends on the organization's policies and size.

- Large organizations usually have IS department that sets specifications
- Medium to small organizations less formal: managers take more active role and usually standardized to single client operating systems.

Category	Hardware	Software
Client	Specify: • CPU speed • Size of main memory • Size of magnetic disk • CD or DVD and type • Monitor type and size	Specify: • Windows, Mac, or Linux OS; may be dictated by organizational standard • PC applications such as Microsoft Office Adobe Acrobat, Photoshop, Paint Shop Pro; may be dictated by organizational standard • Browser such as Internet Explorer, FireFox, or Netscape Navigator • Requirements for the client side of client-server applications • Need for thin or thick client
Server	In most cases, a business manager has no role in the specification of server hardware (except possibly a budgetary one)	• Specify requirements for the server side of client-server applications • Work with technical personnel to test and accept software

Figure 4-14
A Business Manager's Role in Hardware and Software Specifications

6. What are viruses, worms, and zombies?

- **Virus**: Computer program that replicates itself and consumes computer resources. *Payload* is a program code that causes unwanted activity.

- **Macro viruses**: Attach themselves to various types of documents, and they are opened, a virus is placed in startup files of the application. After, it infects every file the application creates or processes.

- **Worm:** Virus that propagates using Internet or network. Spreads faster than other viruses, as it is specifically programmed to spread and actively uses the network to spread.

- **Zombies:** Subsequent computers infected with worm or virus**. A** *Botnet* is a set of computers and applications that are coordinated through a network and used to perform malicious tasks.

Measures to Prevent a Virus

- Most viruses take advantage of security holes in computer programs. Vendors use patches to fix the problems, so managers can check vendors regularly for patches update.

- Every computer should have and use a copy of an **antivirus program.** Viruses and worms are expensive

Chapter 5
Database & Content Management

1) What is content?

- **Content:** a form of creative endeavour that can be protected through a trademark, patent, copyright, industrial design, or integrated circuit topography. It varies by industry.
- All data stored by an organization.
- Considered to be intellectual property.

What is the challenge about managing content?

Recently, because of increases in volume (amount of data stored), and increases in the number of formats it is presented in (pictures, files, videos). Thus difficulties related to content management include:

–Collecting, Distributing and Presenting it.
–Doing all of the above for internal users (employees) & external users (customers etc.)

2) How can content be organized?

- **Content management** has 2 main tasks:

- Managing the content (using database management systems):
- Indexing & cataloguing the right data
- Processing & storing the data

- Presenting the content (using Web Content Management Systems)
- Getting the content to the right person in the right format at the right time.

- **Main challenges of content management:**
- Processing and storing the right content
- Getting the right content to the right person in the right format at the right time

3) What is the purpose of a database?

- **Purpose of a database**: Keep track of data involving multiple themes while spreadsheets –which are used by many professionals – only keep lists of single concepts.

  They are usually stored electronically to facilitate:
- Computer-assisted search and retrieval
- Access for multiple users to view the data they need. –

- **Hierarchy of data elements:**

Data terminology		Storage in a database
Character	=	Byte
↓		↓
Field	=	Column
↓		↓
Record	=	Row
↓		↓
File	=	Table

4) What does a database contain?

❖ **Database:** Self-describing collection of integrated records

➢ Hierarchy of data elements
- Byte is a character of data
- Bytes are grouped into columns/fields
- Columns grouped into rows/records
- Rows are grouped into tables/files

Components: the structure of the database is a collection of tables (files) *plus* relationships among the rows in those tables *plus* **metadata**.

- **Tables or Files**: Values in one table may relate to rows in other table(s).
- Keys: Column(s) that identify unique row in table. Every table has one.

- **Relationships among the records (rows of different tables)**
- Key: one or more data fields in a table that is unique for only one record.
- Foreign Key: keys in a different table than the one in which they reside.
- Relational database: databases using tables, keys, and foreign keys.

- **Metadata (data dictionary)**
- Data that describes data.
- Makes database more useful than a spreadsheet.
- Makes database easier to use.

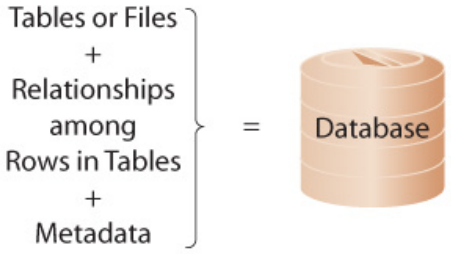


Figure 5-5
Components of a Database

5) What is a DBMS, and what does it do?

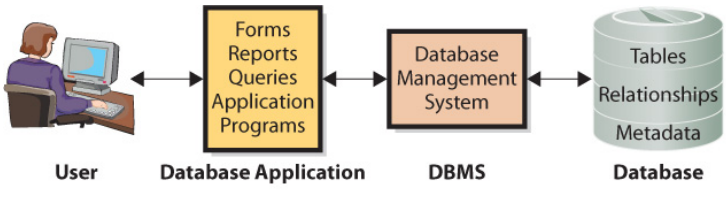


Figure 5-8
Components of a Database Application System

Database Management System: Program that creates, processes, and administers a database (Access). It ensures the consistency, integrity and the security of the DB and is usually licensed from vendors.
Its functions are:

- **Creating or modifying a DB:**
- Use the DBMS used to create tables, relationships and other structures in the database
- Use to define a new table or modify tables

- **Processing DB**

–DBMS is used to read, insert, modify and delete data
–Language used in relational databases: SQL (structured query language).

- **Administering DB**

- Can be used to set up a security system
- Used to back up or remove data
- Add structure to improve performance

6) What is a database application?

❖ **Database Application**: collection of forms, reports, queries, and application programs that process a database. Databases can have more then one application and each one can have multiple users.

❖ **Forms, Reports and Queries**

- Forms: Used to read, insert, modify, and delete data.
- Reports: Show data in structured context and may compute values.
- Queries: Means of getting answers from database data.

❖ **Database Application Programs**

Application programs: while forms, reports and queries process logic specific to a business need and enable database processing over Internet.

- Serves as intermediary between Web server and database
- Responds to events
- Reads, inserts, modifies, deletes data

Multi-User Processing: has its own set of unique problems. s

- Lost-update problem
- Locking used to coordinate activities of multiple users
- Data conflicts produce inaccurate results

7) What is the difference between an enterprise and a personal DBMS?

❖ **Enterprise DBMS**

- Large organizational databases
- Support many users and many different databases
- Support 24/7 operations

➢ Examples: DB2, Microsoft's SQL Server, Oracle

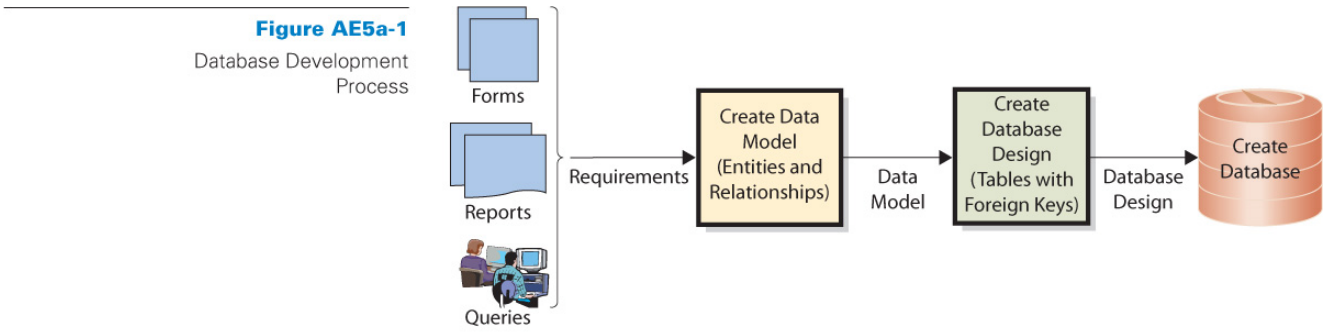
❖ **Personal DBMS**

- Smaller & simpler databases
- Support one user or groups of fewer than 15 users (at most 100)

➢ Example: Access (it is also a DBMS application development product)

Chapter 5 (Part 2)
Database Design

1. How are database application systems developed?



- **Database applications:** consist of Forms, Reports, Queries and Application programs.

- **Developers:** interview users and develop requirements for new system that are summarized in a data model that contains a description of data and relationships and a logical representation of structure of data. Users validate and approve the data model, and then use the database.

- **Database:** Must include all data necessary for users to perform jobs, and no more. Developers rely on users to tell them what to include, check data model and verify correctness and completeness.

2. What are the components of the entity-relationship data model?

Techniques for creating a data model

- **Entity-relationship (E-R) data model**: constituted of entities stored in the database & the relationships among those entities

  - Entity: a thing that users want to track can be a physical object or transaction. It has attributes (describe the character of the entity), and an identifier (attribute or group of attributes whose value is associated with one and only one entity). There are different types of relationships (single to single, one to many, single to many, many to many).

  - Cardinality: signifies the number of entities that can be involved in relationship. The maximum cardinality means the maximum number involved and minimum cardinality means the constraints on minimum requirements.

3. How is a data model transformed into a database design?

Database design: process of converting a data model into tables, relationships, and data constraints. It transforms entities into tables, expresses relationships, defines foreign keys and shows data constraints.

Data integrity problems can happen because of:
- Different names for the same entity
- Produces incorrect and inconsistent information
- Resolve by eliminating duplicated data

Normalization: process of converting poorly structured tables into two or more well-structured tables**.** Normalizing for data integrity can help eliminate data duplication, can be slower to process and is constructed in a way such that every table has single topic.

Relational Database Design

- The designer creates table for every entity
- The entity identifier becomes primary key of the table
- The attributes of the entity become columns
- The tables are normalized to a single theme
- Relationships are drawn between tables
- Foreign keys are added to one or more tables

4. **What is the user's role?**

- Final judges as to what data should contain and they determine how records are related to each other. They need to review the data model and insure that the model reflects an accurate view of business.

Chapter 5 (PS&I)
Using IS to Improve Process

1. What are the fundamental types of processes in organizations?

- **Stability of flow of Business**

- Structured processes: activities follow a fixed predefined sequence.
- Dynamic processes: activities do not necessarily follow a predefined fixed sequence.

- **Business Process:** Sequence of activities for accomplishing a function
- **Activities:** Tasks within a business process

- Resources: Items necessary to accomplish an activity
- Actors: Resources who are either human or computers
- Role: Subset of activities in a business process performed by a particular actor

- **Scope of 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)

- **Objectives of Processes:**
- Effectiveness: Achieve organizational strategy. Helps achieve organizational strategy. Commonly strategic processes have these objectives.
- Efficiency: Create more output with same input or same output with fewer inputs. Seeks to increase output/input ratio, conserve resources. Commonly operational processes have these objectives.

- **Location in the Value Chain**

➢ Primary Activities
- **Inbound logistic processes**: receive, stores & disseminate product input.
- **Operational processes**: transform input to output.
- **Outbound logistic processes**: collect, store, distribute product to buyers.
- **Sales & Marketing processes:** Provide incentives & means for consumers to buy goods.
- **Customer Service processes**: Provide after-sales support.

➢ Support Activities
- **Human Resources:** Create job positions, investigate employee complaints, and staff, train, evaluate employees.
- **Technology Development processes**: design, test, and develop technology in support of primary activities.
- **Infrastructure:** support processes that enable day-to-day operations.

2. What are examples of common business processes?

Value Chain Activity	Operational Process	Managerial Process	Strategic Processes
Primary Activities			
Inbound logistics	Procurement (*Chapter 7*)	Manage inventory	Evaluate potential suppliers
Operations	Assemble product	Schedule maintenance	Open new restaurant
Outbound logistics	Sales (*Chapter 8*)	Award refund	Determine payment policy
Sales & marketing	Mail promotion	Evaluate promotional discounts	Launch new product
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

3. How can organizations improve processes?

- **To improve a process, use the OMIS Model**

- **Objectives: Specify and improve.**
  - Classify objectives as effectiveness or efficiency
  - Make objectives explicit
  - Obtain agreement about objectives
  - Ensure that objectives are not vague or inappropriate

- **Measures: Specify and improve.**
  - **Ensure that measures are: reasonable, accurate, and consistent.**

- **IS**: Implement IS improvements.

4. How can IS hinder a process?

Information Silos: Isolated collections (or databases) of data. The data is not shared, it exists in isolated functional IS. *Why do they exist in departments***?**

- They want to control their data.
- They may have different objectives.
- They may have sensitive data.
- Departmental IS is easy to install.
- Departmental IS is more affordable than an organizational IS.

Possible solutions to "information silo" problem:

- Duplicate the data (may lead to data inconsistency)
- Store a single copy of the data in a shared database

5. How can organizations use IS to improve processes?

Improving a process means it better achieves its objective based on its measure.

Management improving process #1

Through using IS to improve processes

- By improving efficiency & effectiveness of activities
- By improving data flow among activities
- By improving the control of activities
- By using automation
- By improving procedures

Management improving process #2

❖ **Process objectives**

- Classify objectives as effective or efficient.
- Make objectives explicit: find ways to effectively communicate objectives to those executing them.
- Ensure appropriateness of objectives for business strategy.

❖ **Measure of objectives (metrics)**

- Recognise that all measures have limitations
- To achieve good qualities measures:
- Ensure reasonableness of measures
- Ensure accuracy of measures
- Ensure consistency of measures.

Management improving process #3

- By improving an activity that does not involve IS
- By removing unproductive resources from the process
- By improving the feedback generated by the process
- By removing bottlenecks
- By redesigning the business process
- By outsourcing an activity in the process

6. How can SOA improve processes?

❖ SOA: Services-Oriented Architecture

- Middleware facilitates communication and data sharing.

- Design approach for activities based on:

➢ 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.

Chapter 6
Supporting Processes with ERP systems

1. What problem does an ERP system solve?

Information Silo Problem: happens when organizations use several separate information systems that store data separately. This can lead to inconsistent data and other undesirable issues.

- **Solutions**

– **Enterprise Application Integration (EAI):**
  - Software solution that connects information silos
  - Enables existing applications to communicate and share data
  - In doing so, it provides integrated data across departmental boundaries.
  - Leverages existing systems, leaving departmental information systems as is, but providing an integration layer over the top. This is beneficial because it allows organizations to continue taking advantage of their current IT investments and causes less disruption than an ERP implementation.
  - Enables a gradual first step to ERP

– **Enterprise Resource Planning (ERP)**

Unlike EAI, ERP moves all of your processes previously supported by separate information systems into a single IS. In this way, data is stored in a single database and can be shared across processes in various departmental areas. As a result of the single database, the processes can be integrated with one another.

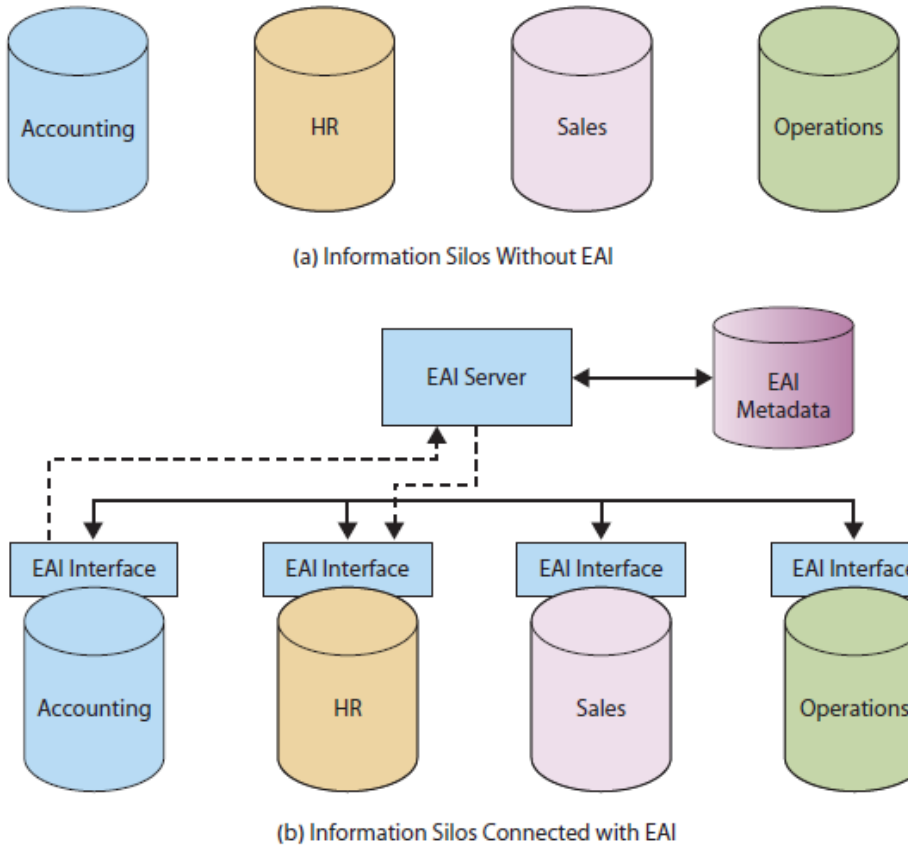


FIGURE 6-1
Enterprise Application Integration (EAI) Architecture

This diagram demonstrates how EAI works. As you can see in section (a), we have information silos. We can use the EAI software to act as an interface between the silos so they can communicate and share data.

2. What are the elements of an ERP system?

- **Manufacturing Software**
  - **MRP:** Materials Requirements Planning. This software was designed to efficiently manage inventory, production, and labor.
  - **MRPII:** next generation of MRP, included financial tracking of manufacturing processes and the ability to schedule capacities.

ERP system: includes three of the five components of an IS: software, databases, and procedures. To create an ERP product, software and databases are installed on hardware and people are trained on the ERP procedures. Today, for a system to truly be considered an ERP system, it must include applications that integrate the processes for Supply Chain Management, Manufacturing, Customer Relationship Management, Human Resources, and Accounting.

- **ERP software** is designed to integrate data and processes across departmental areas in an organization. Each organization has differing business requirements for the ERP software, so the software is often customizes to meet the organization's needs, which is **configuration.**

- **ERP Data:** rely on a DBMS, there are different types of data in an ERP system.
  - **Transactional Data:** data related to events such as a purchase or a student enrollment.
  - **Master Data:** also called reference data, data used in the organization that don't change with every transaction.
  - **Organizational Data**: data about the university such as the location of its warehouses, the mailing addresses of the buildings, and the names it of its financial accounts.

- **Hardware:** Several hardware needs are addressed because of ERP implementations. Among these are storage devices, clients, printers, servers, and others. However, with changes in technology, organizations are now facing a new ERP hardware dilemma. The Cloud has also become a player in the ERP environment, where businesses may "rent" ERP systems with lower up-front and hardware costs.

- **Procedures for an ERP system:** can be very strict and this requires a great deal of training for the users. Often, organizations schedule trainer sessions whereby a third party vendor would train individuals within the organization in order for them to be prepared to train users on an ongoing basis.

- **People involved with the ERP system**: Three basic categories of users.
  - **Users**: interact directly with the system.
  - **Systems Analysts:** Second are analysts, often referred to as systems or business analysts, whose role it is to analyze the system and business processes to maintain and adapt the system after implementation.
  - **Consultants**: perform various roles, from training to configuration of the ERP system.

- **Inherent Business Processes in ERP**

  An ERP system is more than just an IS. ERP also has predefined processes often based on best practices that are designed for ease of implementation and use. These are known as *inherent business processes.* Organizations are often forced to adapt existing processes to these inherent business processes. Organizations do not do this are forced to customize the ERP system to meet their requirements which can be costly.

3. What are the benefits of an ERP system?

- Real-time data sharing allows managers to see trends as they occur and respond to them appropriately.
- ERP implements integrated processes that are industry best practices.
- Effective ERP can lead to better management, as more managers have visibility to more data.
- Information silo problem is solved.
- ERP systems make it easier to exchange data with supply chain partners. Sharing data throughout a supply chain can reduce costs and create efficiencies for every business in the chain. For this reason, some customers and suppliers will not want to do business with an organization that does not use an ERP system.

4. What are the challenges of implementing an ERP system?

- **Decision-Making Challenges**

➢ Organizations implementing ERP systems first must decide on a vendor.

- Once a vendor is selected, a gap analysis is performed to help make determination of how to handle gaps in what they would like the ERP system to do for them. They could decide to write custom code to handle these gaps, or try to find a solution outside of the ERP system.
- Configuration is the next decision. There are over 8,000 possible configuration decisions in an ERP system.
- Then, organizations have to start thinking about data issues. An example of a decision regarding data is the format used for different types of data, like master data.
- Finally, a decision has to be made regarding the transition from the current system to the ERP.

- **People Challenges**

Sometimes an organization needs to configure the ERP system to meet their processes. People issues occur when the ERP system dictates changes in processes for the organization. When that happens, work is changed and is often not well-received by the people in the organization

❖ Management: Many of the challenges involve management. Management can move away from the implementation prematurely, thinking their role will end once the decision to implement has been made. Management may also oversell the product, promising more than can be delivered. In addition to the above two, managers may also fail to anticipate cultural resistance, meaning the impact this will have on people within the organization.

❖ Team: Because of the extent of work required during implementation, it's possible that collaboration within teams breaks down.

❖ Individual: Individuals who are considered users of the system whose work has changed often receive no benefit from the change; they get the pain but no gain.

- **ERP Upgrades**

Decision-making and people challenges are generally experienced during the implementation process. ERP upgrades pose a challenge *after* implementation.

- First, discussions about upgrades may need to occur within a year or two after the original implementation. This may come as a disappointing surprise to some in the organization.

- Second, it may be more challenging to justify upgrades than an original implementation. An original implementation creates unique opportunities, and the contrast of the new ERP system with the old non-ERP system is both stark and encouraging. With an upgrade, these opportunities and the contrast between new and newer are not so vivid.

- A third problem with upgrades is sometimes referred to as *version lock*. Recall that during implementation, the client firm may decide to write custom software to enable the system to do things unique to that client. However, when the ERP vendor upgrades their system to a new version, the new ERP software may not be compatible with the customization done by client firms.
- Finally, upgrades are challenging if the client firm has not developed a long-term strategy for ERP updates.

5. What types of organizations use ERP?

– The first major ERP customers were mostly large manufacturers. Other industries realized they could achieve the same benefits from an ERP system, and they could be more efficient.
  - Distribution, Medical Care, Utilities, Retail, Education, Mining.

– Smaller organizations have also realized that their processes and business requirements are not all that different from larger organizations and could benefit from an ERP system. However, small to medium sized organizations don't always have adequately skilled personnel to successfully implement such systems.

– Finally, global organizations also realize the benefits of an ERP system. Some of the challenges of global business include different currencies and differing languages. ERP systems provide the functionality to address these challenges, making an ERP system a great fit for global business.

6. Who are the major ERP vendors?

A true ERP system must include applications that integrate the processes for Supply Chain Management, Manufacturing, Customer Relationship Management, Human Resources, and Accounting.
SAP (22%), Oracle (15%), Microsoft (10%) and others generally satisfy this criterion.

7. What makes SAP different from other ERP products?

- **SAP Modules:** SAP's ERP product is made up of a collection of interconnected and interdependent modules. The modules can be described as a distinct and logical set of processes. Modules support specific business processes, but the real power of the system lies in the integration across modules.

FIGURE 6-20
SAP Modules

QM	Quality Management	PP	Production Planning
FI	Financial Accounting	CO	Controlling
PM	Plant Maintenance	SD*	Sales and Distribution
HR	Human Resource	MM**	Materials Management
PS	Project Systems	BI	Business Intelligence

*SD includes sales processes, the topic of Chapter 8.
**MM includes procurement processes, the topic of Chapter 7.

- **SAP Inputs and Outputs:** SAP inputs and outputs provide usability features. Data is stored in a single centralized database and when running various transactions in the system, users enter information that calls up additional information from the database, making transactions smooth.

- **SAP Business Suite:** SAP software is now bundled into SAP Business Suite, which is composed of various applications.

- SAP Customer Relationship Management
- SAP Supplier Relationship Management
- SAP Supply Chain Management.
- SAP NetWeaver: application platform on which these mentioned applications run. It offers several advantages to SAP customers, which includes capabilities that allow for these applications to integrate with non-SAP applications.

Chapter 6
Networks & Collaboration

1. Why should I care about Networks?

- Computers are more useful to people when they are connected to networks. When connected to the Internet, you are part of a functioning network of networks containing millions of computers.

❖ **Collaboration**: when two or more people work together to achieve a common goal, result, or product. Effective collaboration produces results greater than those that could be produced by any of the individuals working alone. It involves coordination and communication.
The effectiveness of a collaborative effort is driven by four critical factors, which might not be equally important for all collaborations:

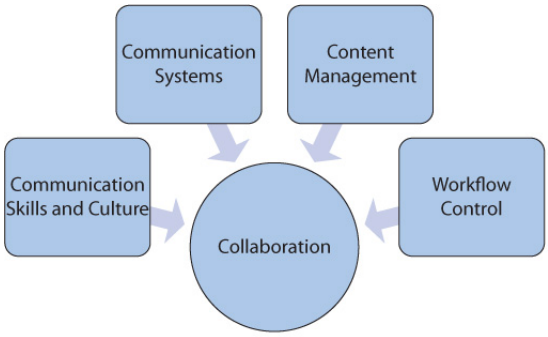


Figure 6-1
Critical Factors in Collaboration

❖ **Network externality**: the larger the number of people using a network, the more valuable that network becomes. It is also called "network effect". The benefit gets larger as more people use it. Network growth leads to congestion problems or the market may become saturated

2. What is a computer network?

❖ **Computer network:** collection of computers that communicate with one another over transmission media, which can be physical media, such as copper cable and optical fibre or wireless media transmitting light or radio frequencies. There are three basic types of computer networks.

Type	Characteristic
Local area network (LAN)	Computers connected at a single physical site
Wide area network (WAN)	Computers connected between two or more separated sites
The Internet and internets	Networks of networks

Figure 6-2
Major Network Types

- **LAN:** connects computers within a relatively small, single geographic location. The number of connected computers can range from two to several hundred. The distinguishing characteristic of a LAN is that it is in *a single location.* Communication lines can be placed where the organization wants.

- **WAN:** connect computers at different geographic locations. Computers are connected between two or more separated sites and use communication networks from vendors. The government licenses them.

- **The Internet and internets:** Network of networks that connect LANs, WANs, and other internets. The Internet is used for emailing and web browsing and private networks of networks are internets

3. What are the components of a LAN?

❖ **Local Area Network:** Computers are connected on a single company site, usually located within half-mile area. The company-operating network controls the property. Its components are:

- Switch: special purpose computer that receives and transmits messages on the LAN
- Network Interface Card (NIC): Hardware that connects each device's circuitry to the cable, or Onboard NIC or card that fits into an expansion slot.

❖ **Network Interface Card (NIC):** hardware component present on each device on a LAN. The ***NIC*** connects the device's circuitry to network cable. Its media connections include:

- Unshielded twisted pair (UTP) cable: RJ-45 connector
- Optical fibre cables: Light rays reflected inside glass core surrounded by cladding. The cables use ST and SC connectors.

❖ **Ethernet protocol standard:** is part of the LAN.

- Specifies hardware characteristics
- Describes how messages are packaged
- Determines how messages are processed
- Operates at Layers 1 and 2 of TCP/IP-OSI architecture
- Personal computers usually support **10/100/1000 Ethernet-** transmission rate of 10, 100, or 1000 Mbps (megabits per second).

❖ **Wireless NIC (WNIC):** A computer network that allows users to connect without using a network cable. For a LAN operation,

- NICs operate on 802.3 protocol
- WNICs operate on 802.11 protocol (Wi-Fi)
- WNICS connect to Access Point (AP) that processes both standards.

4. Why is mobile computing important?

Two trends for accessing the Internet:

- Desktops are being replaced by laptops
- Internet is also often accessed through smartphones or tablets.

→Cellular telephones are no longer just phones but, rather, mobile devices that provide a wide variety of services. They are devices built for communication and collaboration and are, at the core of their designs, networking machines.

→Smartphones combine a powerful processor with sophisticated operating systems and cellular network technology to provide a host of applications, such as voice, text, email, web browsing, and much more, to their users.

- Smartphones are also enabling new applications - **m-commerce,** mobile commerce that allows for mobile banking, mobile ticket purchases etc. 3G (3rd generation network): easy to use design and what most smartphones operate on.

- 3G is a group of standards for wireless communications, that provides higher data transfer rates and allows for simultaneous use of voice and data transfer (compared to 2G). The difference between 2G and 3G is that 3G provides higher data transfer rates and allows for simultaneous use of voice and data transfer.

5. What do I need to know about connecting to the Internet?

The Internet: is a WAN, which computers located at physically separated sites. An important component in any WAN is a **router. Routers are special-purpose** computers that implement the protocol for WANs. When you connect your personal computer to the Internet, you are working with a router to use the Internet. The router normally connects your computer to computers owned and operated by your **Internet service provider (ISP).**

Names and Addresses

- Top-Level Domain (TLD): .ca, .com, .org, .biz
- Uniform Resource Locator (URL): easy to remember address on the Internet
- IP address is a numbered address for each machine connected to the network

❖ Obtaining an IP Address

- Two kinds of IP addresses

- Public IP addresses are used on the Internet
- Private IP addresses are used within private networks and internet – they are controlled only by the private company that operates them.

- **DHCP Server**: Dynamic Host Configuration Protocol server is a computer or router that assigns a temporary IP address to your computer. When you disconnect, the IP address is available again, and the DHCP server re-assigns it when it is needed

- **Domain Name System (DNS):** converts human-friendly URLs into computer-friendly IP addresses. The domain name resolution is when it is converted into a public IP address; domain name resolvers do it.

❖ Analog versus Digital Signals

- **Three ways of connecting Home and Small-business computers to an ISP**:
  - Through a regular telephone line
  - Through a special telephone line called a *DSL line*
  - Through a cable TV line

→Those three connections require that the digital data in the computer be converted to an **analog**, or wavy signal before being sent. When receiving data, the analog signal must be converted to a digital signal before the computer can read it.

→A device called a modulator/demodulator, or **modem**, performs these conversions. Different modems use different protocols and speeds.

❖ Types of Modems

- **Dial-Up Modems:** Operate over regular telephone lines and interfere with voice telephone service. They perform the conversion between analog and digital and the connection is made by dialing ISP's phone number. The maximum transmission speed of 56 kbps.

- **DSL (Digital Subscriber Line) modems**: operate on the same lines as voice telephones and dial-up modems, but they do not interfere with voice telephone service. It had a faster data transmission than dial-up and the connection is always maintained. The download and upload speeds may vary:

- Asymmetric Digital Subscriber Lines (ADSL)
- Symmetrical Digital Subscriber Lines (SDSL)

- **Cable Modems:** Provide high-speed data transmission and the connection is always maintained. They use high-capacity optical fiber cable television lines that run to neighborhood distribution centres. Television cables connect at the distribution centre and run to subscribers (up to 500 per one center). They do not interfere with television transmission. Transmission speeds can vary:

- Narrowband – less then 56 kbps
- Broadband – in excess of 256 kbps

- **Wireless WAN (WWAN):** differs from a wireless LAN. It covers a larger area and uses cellular networks to transfer data. Portable computer with a wireless WAN modem connects to a base station on the wireless networks via radio waves. The radio tower carries the signal to a mobile switching centre, where the data are passed on to the appropriate network. Wireless service provider then provides the connection to the Internet.

Line Type	Use	Maximum Speed
Telephone line (twisted pair copper lines)	Dial-up modem	56 kbps
	DSL modem	3 Mbps
	WAN—T1—using a pair of telephone lines	1.544 Mbps
Coaxial cable	Cable modem	Upstream to 768 kbps Downstream 1–6 Mbps (usually much less, however)
Unshielded twisted pair (UTP)	LAN	10 Gbps
Optical fibre cable	LAN and WAN—T3, OC-768, etc.	40 Gbps or more
Satellite	WAN—OC-768, etc.	40 Gbps or more

Figure 6-12
Transmission Line Types, Uses, and Speeds

6. How does e-mail actually work?

❖ IETF Network Levels

The Internet Engineering Task Force (IETF) developed a four-layer scheme called the **Transmission Control Program/Internet Protocol (TCP/IP)** architecture.

- Layer 1 is used to transmit data within a single network
- Layers 2 & 3 are used for data transmission across an internet
- Layer 4 provides protocols that help different applications interact with each other and the person using the computer.

- Emailing Steps

- **Step 1: Getting Internet Access and Pressing "Send/Receive"**

Your email program operates at Layer 4. It generates and receives email and attachments according to one of the standard email protocols, most likely a protocol called simple mail transfer protocol (SMTP).

- **Step 2: Break Apart Message and Get Ready for Transport**

This is the job of the Transmission Control Program (TCP) that operates at Layer 3. TCP examines the email you are sending and break apart large messages into pieces called *segments*.

- **Step 3: Send and Receive Packets**

TCP interacts with protocols that operate at Layer 2. The Layer-2 protocol is the Internet Protocol (IP). The chief purpose of IP is to route messages across an Internet. To send a segment to the router, the IP layer program first packages each segment into a *packet*.

- **Step 4: Reassemble Packets and Display Message**

Once the email packets arrive at the correct destination router, they are sent off to a mail server. TCP waits for all the packets to arrive and then unpacks the packets back into segments.

7. What are firewalls, encryption, and VPNs?

❖ **Firewall**: Computing device that prevents unauthorized network access. It can be a special-purpose computer or program. Access Control List (ACL) encodes rules stating what packets are allowed or prohibited.

- Organizations may have multiple firewalls
- Perimeter firewalls sit outside organizational network.
- Internal firewalls are inside network.
- Packet-filtering firewalls examine source address, destination address, and other data before allowing message to pass.
- May filter both incoming and outgoing messages.

❖ **Encryption**: process of transforming clear text into coded, unintelligible text for secure storage or communication. A key is a number used to encrypt data. The encryption algorithm can code and decode messages. The algorithm applies the key to the original message to produce the coded message. Decoding (decrypting) a message is a similar process; a key is applied to the coded message to recover the original text.

- Symmetric encryption: the same key is used to encode and to decode. Symmetric encryption is simpler and much faster than asymmetric encryption.

- Asymmetric encryption: different keys are used; one key encodes the message, and the other key decodes the message.

How it is happens:

- 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.

At the end of the session, your computer and the secure site discard the keys. Using this strategy, the bulk of the secure communication occurs using the faster symmetric encryption. And, because keys are used for short intervals, there is less likelihood they can be discovered.

- **Virtual Private Network (VPN):** Uses public Internet to create appearance of private point-to-point connections. Client and server have point-to-point a connection called a tunnel, which is a private pathway over shared network where secure, encrypted communications can be exchanged.

8. How does a search engine work?

Search engines: tool used to search for information on the Internet. They require two things.

- A way to collect URLs: web crawlers browse the web to find URLs
- A method for storing/accessing the URLs so that they can be searched: search engine indexing creates indexes for the results from the web crawling.

Chapter 7
Supporting the Procurement Process with SAP

1. What are the fundamentals of a Procurement process?

Procurement: operational process of obtaining goods and services using least time and money with following activities:

- **Ordering**: can be performed by individuals in the purchasing unit within the organization, notably the purchasing manager.

- **Receiving:** The order for procurement would be sent to the supplier who will in turn deliver materials and/or services to the organization. In turn, these materials and/or services must be received by the organization to take ownership of them. This step in the process is generally handled in the warehouse by the warehouse manager (usually only for materials, not services).

- **Pay**: Ownership of the materials and/or services results in a liability or an obligation to compensate the supplier with payment. The accounting department would then be responsible for settling this liability by sending payment to the supplier.

- **Supporting the Inbound Logistics Process within the Value Chain**
  - Procurement of raw materials needed for production

Primary Activity	Description	Process and Chapter
Inbound logistics	Receiving, storing, and disseminating inputs to products	Procurement, Chapter 7
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	Sales, Chapter 8
Customer service	Assisting customers' use of products and thus maintaining and enhancing the products' value	

FIGURE 7-2
Procurement Process within the Value Chain of CBI

- Information Systems Silos: Activities in the procurement process are separate, non-integrated systems that were created to serve the needs of the different functional areas involved in the process. Unfortunately, having these systems silos adds steps to the process, and means that multiple databases will be used to complete the procurement process.

  - **Sales DB:** Monitor demand for materials
  - **Purchase Order DB:** Manage purchase order information
  - **Warehouse Database:** Manage inventory levels
  - **Accounting DB**: Manage payables

2. What were the problems with the Procurement process before SAP?

- **Warehouse Problems**
  - Manager lacked sales price data.

- **Accounting Problems**
  - Three-way match for payment was a challenge (between the purchase order, goods received and the invoice from the supplier).
  - Correcting discrepancies were labor intensive
  - Time delays in updating accounting data

- **Purchasing Problems**
  - Purchasing wasn't a centralized function
  - Inexperienced users that led to errors in data entry
  - Pressure for greater financial controls

ERP System
  - Provides solutions to CBI's problems, concerning warehouse, accounting, and purchasing activities. Information flows will improve as well as provisions for greater financial controls within the organization.

3. How does CBI implement SAP?

- CBI had to reexamine and refocus their strategy to implement SAP, using the implementation processes (reexamine, gap analysis).

In re-examining their strategy, they identified a competitive strategy and selected an ERP vendor, SAP, to support this strategy. After conducting the gap analysis, the ERP Team developed objectives and measures for the procurement process.

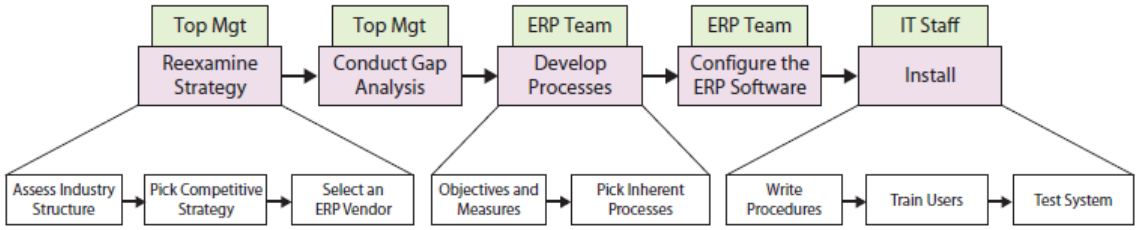


FIGURE 7-9
SAP Implementation Process at CBI

- **CBI had to determine industry structure using Porter's Five Forces**

- Using this model, CBI discovered the wholesale bike industry has strong rivalry with low switching costs. For CBI, this means a retailer could easily switch from one bike maker to another.

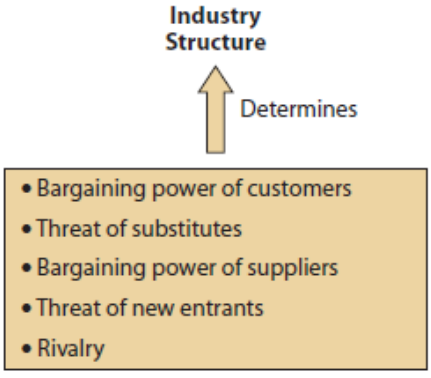


FIGURE 7-10
Determine Industry Structure with Five Forces Model

- Clear approach to implementing SAP
  - Found their position in their industry
  - Defined a competitive strategy
  - Created objectives and measures for their processes

In accordance with their approach to successfully implement the SAP ERP software, CBI's industry analysis helped them define a clear competitive strategy that would help them find their position within their industry.

4. How does the Procurement process work at CBI after SAP?

- Maintained same three major activities
  - Order; Receive; and Pay
- Solutions to prior problems
  - Purchasing
  - Warehouse
  - Accounting
- Benefits of SAP

After CBI implemented SAP, the three fundamental activities in the procurement process remained (Order, Receive, Pay). However, SAP now provides CBI with a single database system where all data and information is stored together, not separately, as in the past. Prior problems that existed before the SAP implementation were resolved. If you recall, CBI had experienced several problems specific to purchasing, the warehouse, and accounting.

- **New Purchase Process**

The creation of a new purchasing department helped centralize the purchasing activities and reduced the need for extensive training. With the implementation of SAP, all data and information is stored into a single database. With SAP, CBI now uses automatically generated **purchase requisitions**, an internal company document, to initiate the purchasing activities. To reduce errors in data entry, purchase requisitions can be converted directly into purchase orders.

- **Warehouse**
  - Goods receipts entered into same database as PO's
  - SAP verifies the goods received against the PO
  - Immediate update to inventory
  - SAP documents this in the database

- Goods Receipt
  - Three-way check completed by SAP
    - Less labor intensive
    - Incoming invoices are compared to PO and Goods Receipt for verification
  - Payment simplified
  - Accounting updated automatically in SAP
  - SAP documents these steps in the database

- **Benefits of SAP for the CBI Procurement Process**

FIGURE 7-19
CBI Problems and SAP Benefits

CBI Problems	SAP Benefits
Warehouse Warehouse manager does not have data on sales price discounts.	Integrated inherent process allows warehouse to see sales process prices.
Accounting Three-way match discrepancies take time to correct. Accounting data are not real time.	Real-time data sharing limits errors. Real-time data sharing reduces roll-up time.
Purchasing Agents not centralized; training, experience, 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.

5. How can SAP improve supply chain processes at CBI?

- **Supply Chain Processes**
  - Supplier Relationship Management (SRM): reducing costs of procurement while building stronger relationships with suppliers.
  - Returns Management: focuses primarily on all aspects of handling customer returns in an efficient manner.
  - Supplier Evaluation: determine criteria for sourcing decisions for procurement
  - Supply Chain Management (SCM): administration of supply chain processes.

Process Scope	Supply Chain Processes
Operational	Procurement
Managerial	Supplier Relationship Management (SRM) Returns Management
Strategic	Supplier Evaluation

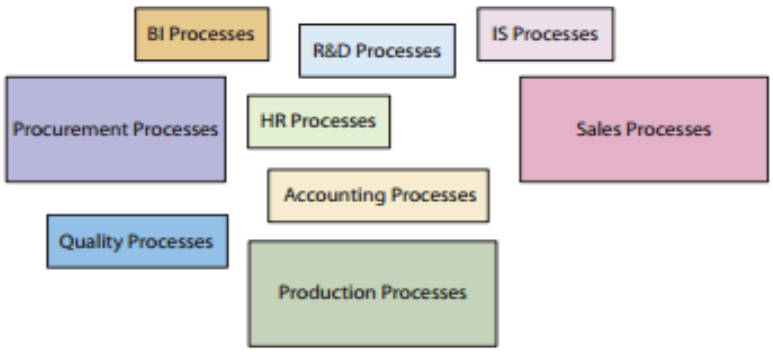
FIGURE 7-21
Sample of Supply Chain Processes

- **Improving Supply Chain Processes by Sharing Data:** Overall, the more data moves, the more efficient the process becomes as less inventory is needed.

- **Improving Supply Chain Processes with Integration:** Process synergy occurs when processes are mutually supportive. This means that when one process is done well, it supports the objectives of another process. Synergy can also exist across processes that span outside of an organization.

Improving CBI Processes Beyond the Supply Chain: SAP can improve one procurement but also a set of processes in supply chain management. Many firms first use SAP to improve just one function of the business. The most common enterprise-wide approach is to use SAP is to use it in Accounting, Procurement, Production, and Sales.

FIGURE 7-25
Major Categories of Business Process in Enterprise-wide Systems



6. What new IS will affect the Procurement process in 2024?

Other ISs than SAP emerging will have a significant impact on procurement over the next 10 years. The impact of these technologies will vary by company and industry, but the following will drive the next generation of procurement process improvements.

- **Augmented reality (AR),** computer data or graphics are overlaid onto the physical environment.
- **Radio-frequency identification** (RFID) technology can be used to identify and track items in the supply chain.
- **Sensors/tracking** devices make transportation activity of the procurement process more efficient.
- **Robots** can reduce inventory costs markedly for CBI and other firms.
- Finally, through **3D printing** (*or additive manufacturing*), objects are manufactured through the deposition of successive layers of material.

Chapter 9
E-Commerce & Social Networking

1. What is E-Commerce, and how is it used?

E-Commerce: generally consists in buying and selling of goods and services over public and private computer networks. It has a number of implications that include the following:

- From a Tech perspective: additional infrastructure will probably be required. Large organizations may provide and support many of these capabilities internally, but smaller organizations may outsource a lot. In all cases, coordination and linkages to existing processes and systems may be required; e-commerce may require interconnectedness of the entire enterprise resource planning (ERP) process.

- From a managerial & government perspective: Before the enterprise management systems are securely connected, organizations need to ensure that all aspects of the business operate smoothly and do not operate at cross-purposes. Externally, companies need to ensure that end-to-end customer security is enabled and that the information is only shared appropriately and with customer permission.

❖ E-Commerce Categories

- Merchant companies: take title to the goods they sell, buy goods and resell them & sell services that they provide.

  - **Business-to-consumer (B2C):** Sales between a supplier and a retail customer (the consumer).
  - **Business-to-business (B2B):** Sales between companies.
  - **Business-to-government (B2G)**: Sales between companies and governmental organizations.

- Nonmerchant companies: arrange for the purchase and sale of goods without ever owning or taking title to those goods. They sell services provided by others.

  - **Clearinghouses** provide goods and services at a stated price and arrange for the delivery of the goods, without ever taking title of G/S.
  - **Auctions**: match buyers and sellers by using an e-commerce version of a standard auction.
  - **Electronic exchanges** match buyers and sellers; the business process is similar to that of a stock exchange.

❖ Benefits of E-Commerce

- Disintermediation: removal of intermediates between parties, which results in higher revenues for manufacturers & lower consumer prices. Distribution channels become more efficient.

- Flow of price information: is improved, consumer pays lowest possible price, inefficient vendors are removed from the market, which becomes efficient as a whole.

- Sellers are more aware of price elasticity: through buyer behavior in auctions, and experiments.

❖ Issues with E-Commerce

- Possible channel conflicts
- Possible price conflict with traditional channels.
- Reduced profitability due to increasing prices caused by competitive price info available to all customers, and increased negotiation power of customers.
- Customer service expense increases (B2C)
- Showrooming
- Taxation (different countries, locations rates).
- Logistics expense

2. What is social networking, and how is it enabled and affected by IS/IT?

Social network: 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.

There are three types of capital:

- Physical: the investment of resources for future profit.
- Human: the investment in human knowledge and skills for future profit
- Social: investment in social relations with the expectation of returns in the marketplace

❖ **Social Capital:** can be earned through social networking. It adds value in four ways:

- Provides information about opportunities, problems, alternatives etc.
- Provides opportunities to influence decision makers critical to one's success.
- Create social credentials when one is linked to highly regarded contacts.
- Reinforces professional image (Personal reinforcement) in an industry or organization.

Value of social capital is determined by:

- The number of relationships
- Their strength
- The resources controlled by those relationships.

❖ **The Importance of Weak Relationships**

- Strong relationships: create the most social capital in a social network, but weak relationships contribute the most to the growth of social networks.
- Weak ties: crucial in increasing the number of relationships in your network. The people you know the least contribute the most to your network.

❖ **How Do Social Networks Add Value to Business?**

- Organizations: also have social capital. Their social capital is also measured by number of relationships, strength of relationships, and resources controlled by "friends." Historically, organizations have created social capital via salespeople, via customer support, and via public relations.
Today, progressive organizations maintain a presence on Facebook, LinkedIn, Twitter, and possibly other sites. The downside is the increased scrutiny due to info sharing and assumptions made based on these.

How is Social Networking Enabled by IS/IT?

- Computers are omnipresent and relatively cheap.
- Improved Search Capabilities: we can quickly sort through large amounts of data.
- Reduction in the trade-off richness and reach: keep track of many more people and enhance personalization.
- Network Effects: IT/IS increases the speed at which networks grow and how useful they become.

3. What is Web 2.0?

Web 2.0: 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 a specific technology. It describes applications and platforms on the web.

❖ How can non-Internet businesses benefit from Web 2.0?

- Advertising: targeted advertising, Advertising fee/word can be flexible. Cost is less than traditional advertising methods.
- Mashup of websites of non-Internet companies.

❖ Software as a Service (SAAS)

Web 2.0 companies do not sell software licenses because software is not their product but they provide it as a service (SAAS). Several software items are obtained from a thin-client browser, with the bulk of the processing occurring in the cloud, somewhere on the Internet.
The Web 2.0 business model relies on advertising or other revenue that results as users employ the SAAS. Traditional software vendors depend on software license fees.

❖ Use Increases Revenue

Another characteristic of Web 2.0 is the extent of network effects.
The value of the site increases with users and use. The term user-generated content (UGC) refers to website content that is contributed by users. Although reviews are still the bulk of such content, some companies have created websites and tools that encourage users to contribute in other ways (crowdsourcing).

Chapter 11
Structure, Governance, Ethics

1. How is the IT department organized?

❖ **IT systems services:** The department of people who provide technical support for IT services such as email systems, accounting applications, desktop computers, and mobile devices which are used in most organizations.

- Organizational structure varies: depending on the organization's size, culture, competitive environment, industry, and other factors. Larger organizations with independent departments will have a group of senior executives. Smaller companies may combine some of these departments.

- Technology office: investigates new information systems technologies and determines how the organization can benefit from them. For example, many organizations are using web services technology and planning how they can best use that technology to accomplish their goals and objectives.

- 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 over time.

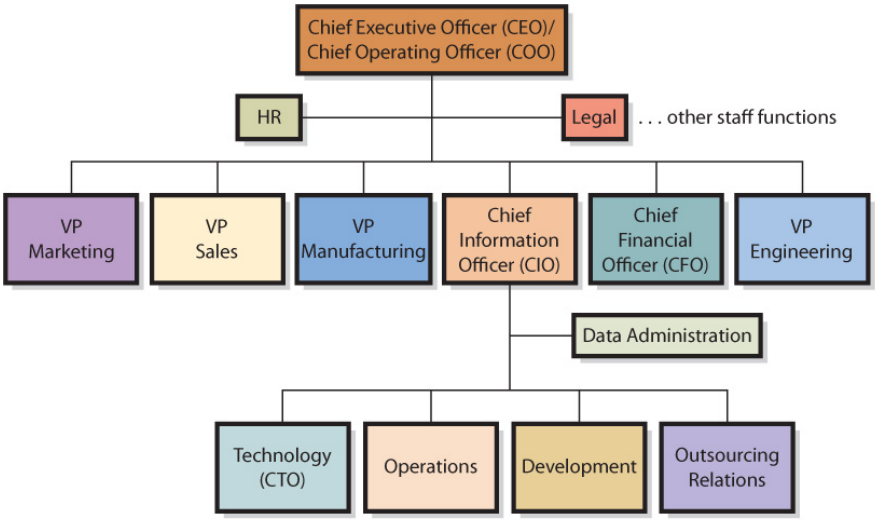


Figure 11-1
Typical Senior-Level Reporting Relationships

❖ **The Web**

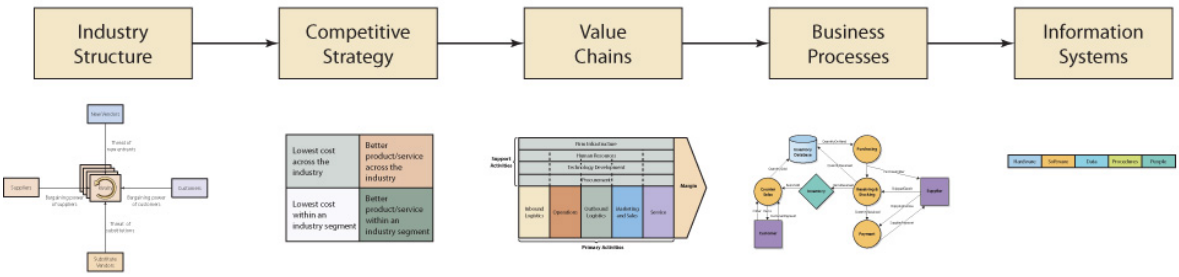
- Websites: Traditionally designed and maintained by the IT department, but now this task belongs to the marketing department in order to keep up with branding and control of content; while IT provides technical support for the website. Project managers. Lead analysts, developers and technical analysts are on the web development team.

2. What is information technology architecture?

- **IT architecture:** basic, but complex framework for all the computers, systems, and information management that support organizational services. Its complexity increases as more services are supported and different technologies are used. A popular metamodel to organize the IT architecture is Zachman's framework.

- **Enterprise architect:** person who manages the IT architecture. He/she creates a blueprint of an organization's information systems and the management of these systems; while developing the blueprint, the architect considers organizational objectives, business processes, databases, information flows, operating systems, applications and software and supporting technology.

Figure 11-3
Organizational Strategy and Information Systems



3. What is alignment, why is it important and why is it difficult?

Alignment: ongoing process of matching organizational objectives with IT architecture. Fitting IT architecture to business objectives is continuous challenge. It is measured as the degree to which the IT department's missions, objectives, and plans overlapped with the overall business missions, objectives, and plans. Communication between business and IT executives is the most important indicator of alignment.
It is difficult to achieve because it depends on organizational context, business goals & IT architecture in the organization.

4. What is information systems governance?

IS Governance: dvpt of consistent, cohesive management policies and verifiable internal processes for IT & related services. The goal of IS governance is to improve the benefits of an organization's IT investment over time by:

- Improving service quality
- Reducing service costs and delivery time
- Reducing IT risks
- Better support business processes

The goals can be reached by establishing:

- Reporting structures.
- Review processes.

There are laws that force companies to comply with governance standards for collecting, reporting, disclosing information such as Budget Measures Act (Canada).

5. What is an information systems audit?

Information Systems Audit: Examination and verification of a company's information resources that are used to collect, store, process, and retrieve information – including an organization's IS policies and procedures. Many firms offer IS audit services.

- **Control Objectives for Information and Related Technology (COBIT):** framework of best practices designed for IT management. It provides a set of generally accepted measures, indicators, processes & best practices to get the most from IT investments. It also provides a process that enables the organization to move in the right direction towards alignment.

6. What is information systems ethics?

- **Information systems ethics**: is about people involved with the system, not hardware or software. IS ethics is about understanding our own behaviour—the way we think and act in situations where our choices affect others.

Ethical principles include:
- United Nations Declaration of Human Rights
- Canada's Charter of Rights and Freedoms
- Association of Computing Machinery's code of ethics

What is Green IT?

Green IT: considers the effects of choices an organization makes on people and the environment. It is about using IT resources to better support the triple bottom line (traditional profit, ecological performance, social performance) for organizations. Its goals include improving energy efficiency, promoting recyclability, reducing the use of harmful materials.

Chapter 12
Managing Information Security & Privacy

1. What is identity theft?

Identity theft: vital information such as a person's name, address, date of birth, social insurance number, and mother's maiden name are acquired to complete impersonation. With this information, the identity thief can take over a victim's financial accounts; open new bank accounts; transfer bank balances; apply for loans, credit cards, and other services.

2. What is PIPEDA?

❖ **PIPEDA: Personal Information Protection and Electronic Documents Act.**

The Act is intended to balance an individual's right to the privacy of his or her personal information, which organizations need to collect, use, or share for business purposes. The Privacy Commissioner of Canada oversees this Act. PIPEDA governs how data are collected and used.

- Personal information: is defined under this Act as information about an identifiable individual, but does not include the name, title, business address, or telephone number of an employee of an organization. The Act gives individuals the right to know why an organization collects, uses, or discloses their personal information. So organizations are required to identify why they are collecting information and how they will use it. PIPEDA also requires organizations to identify anyone in the organization who is responsible for keeping personal information private and secure and allows other individuals to have access to this information, as necessary, to check its accuracy. PIPEDA creates some protection of personal privacy.

3. What types of security threats do organizations face?

Organizations face security threats as well. Three sources of them are:

1. Human errors and mistakes

Human errors and mistakes include accidental problems caused by both employees and others outside the organization (procedural/physical accidents, incorrect procedures).

- Accidental problems
- Poorly written programs
- Poorly designed procedures
- Physical accidents
- Malicious human activity
- Intentional destruction of data
- Destroying system components
- Hackers
- Virus and worm writers
- Criminals
- Terrorists

2. Malicious human activity

This category includes employees and others who intentionally destroy data or other system components. It also includes hackers who break into a system, virus and worm writers who infect computer systems, and people who send millions of unwanted emails (referred to as **spam).**

3. Natural events and disasters

Natural events and disasters are the third source of security problems. This category includes fires, floods, hurricanes, earthquakes, tsunamis, avalanches, and other acts of nature. Problems in this category include not only the initial loss of capability and service but also losses stemming from actions to recover from the initial problem.

Five types of security problems are:

Figure 12-1
Security Threats

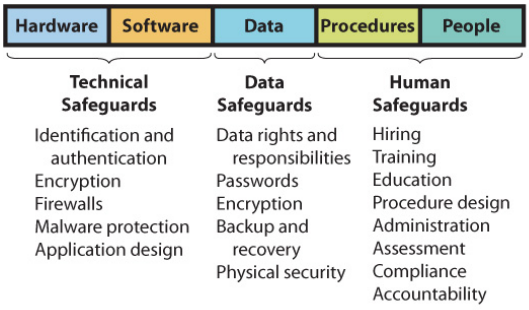
		Source		
		Human Error	**Malicious Human Activity**	**Natural Events and Disasters**
Problem	**Unauthorized data disclosure**	Procedural mistakes	Pretexting Phishing Spoofing Sniffing Computer crime	Disclosure during recovery
	Incorrect data modification	Procedural mistakes Incorrect procedures Ineffective accounting controls System errors	Hacking Computer crime	Incorrect data recovery
	Faulty service	Procedural mistakes Development and installation errors	Computer crime Usurpation	Service improperly restored
	Denial of service	Accidents	DOS attacks	Service interruption
	Loss of infrastructure	Accidents	Theft Terrorist activity	Property loss

Types of Problems

- **Unauthorized data disclosure:** due to human error, like posting private information in public place, placing restricted information on searchable Web sites or inadvertent disclosure.
- **Malicious release:** Through pretexting, phishing, spoofing, sniffing
- **Incorrect data modification:**
  - Human errors: incorrect entries and information, procedural problems, systems errors, hacking.
  - Faulty Service: incorrect system operation, usurpation.
- **Denial of service (DOS):** due to human error or denial-of-service attacks (flooding server etc.)
- **Loss of infrastructure:** Accidental**,** theft, natural disasters.

Elements of a Security Program

- Senior management: must establish a security policy; manage risk, balancing costs and benefits of a security program.
- Safeguards: are protections against security threats.
- Incident response: must be planned prior to incidents



Effective security requires balanced attention to all five components!

Figure 12-2
Security Safeguards as They Relate to the Five Components

4. How can technical safeguards protect against security threats?

❖ **Technical safeguards involve hardware and software components**
- User names and passwords would help with identification and authentication.
- Smart cards: provide a Personal identification number (PIN)
- Biometric authentication: include fingerprints, facial scans, retina scans

❖ **Encryption and firewalls**
  - o Malware Protection
- Viruses & Worms
- Spyware: mostly malicious
- Adware: not malicious

  - o Malware Safeguards
- Install antivirus and anti-spyware programs
- Scan hard drive and e-mail frequently
- Update malware definitions
- Open e-mail attachments only from known sources
- Install software updates promptly
- Browse only reputable Web sites

5. How can data safeguards protect against security threats?

❖ **Data safeguards**: involves the data component of IS, objective is to protect databases and other organizational data.
  - o Data administration: develops data policies and enforces data standards.
  - o Encryption keys: key escrow
  - o Backup copies: stored off-premise, validity has to be checked often.
  - o Physical security: is necessary. Lock and control access to facility and maintain entry log.
  - o Third party contracts: safeguards are written into contracts, they have the right to inspect premises and interview personnel.

6. How can human safeguards protect against security threats?

Human safeguards: involve **people** and **procedure** components of IS. Organization needs to design appropriate security procedures considering employees and non-employee personnel.

Human Safeguards for Employees
- Define job tasks and responsibility
- Separate duties and authorities
- Grant least possible privileges
- Document security sensitivity

- o Hiring and screening employees: the higher the sensitivity of the position, the more extensive is the screening process.
- o Dissemination: Employees need to be made aware of policies and procedures and security training.
- o Enforcement of policies: Organization should define responsibilities, hold employees accountable, encourage compliance. The organization should also create policies and procedures for employee termination, protect themselves against malicious actions in unfriendly terminations and remove user accounts and passwords.

Human Safeguards for Non-Employee Personnel: such as temporary personnel and vendors.
Screening personnel, training them should be a priority. The contract should include specific security provisions and provide accounts and passwords with the least privileges. The organization should also 'harden' its system (take extraordinary measures to reduce system's vulnerability) and protect these users from internal company security problems.

Account Administration

- **Account management procedures:** include the creation of new user accounts, modification of existing account permissions and removal of unneeded accounts.

- **Password management:** propose acknowledgment forms and change passwords frequently.

- **Help-desk policies:** create authentication of users who have lost their password, but the password should not be e-mailed (just a notification of password change should be given).

- **System procedures:** include normal operations, backup and recovery.

Procedures of each type should exist for each IS and the definition and use of standardized procedures reduces the likelihood of computer crime. Each procedure type should be defined for system users and operations personnel.

Security Monitoring

- Analyze activity logs : Firewall logs, DBMS log-in records, Web server logs are only useful when analyzed.

- Security testing: conducting by in-house and external security professionals.

- Investigate incidents and find out how they are an indication of potential vulnerability and corrective actions.

7. What is disaster preparedness?

A substantial loss of computing infrastructure caused by acts of nature, crime, or terrorist activity can be disastrous for an organization.

- Best safeguard against a disaster is appropriate location. If possible, place computing centers, web farms, and other computer facilities in locations not prone to floods, earthquakes, hurricanes, tornados, or avalanches.
- Even in those locations, place infrastructure in unobtrusive buildings, basements, backrooms, and similar locations well within the physical perimeter of the organization.

As well, locate computing infrastructure in fire-resistant buildings designed to house expensive and critical equipment.

8. How should organizations respond to security incidents?

- Organization must have plan that details reporting and response.
- Centralized reporting of incidents allows for application of specialized expertise.
- Preparation pays off: identify critical employees and contact numbers, train employees.