Chapter 1 MIS and You:

MIS – Management Information System.
Information system – a group that interacts to create information.
Includes everything from hardware (electronic components) – software (programs that run/operate systems) – data (blocks of information) - procedures (the way to get to the desired object) and people (actors that interact with the system.)
Technology is like a *computer* and information *reduces uncertainty.*
MIS has 3 basic elements:

1. Development and use
   Information system is developed and used by someone.
   Where did the information come from? How was the system constructed? What has the people using the system to do with the development?
2. Information system
3. Goals and objectives
   Information system exists to help organizations to meet their goal. Information technology (IT) refers to methods and raw technology. IT cannot help an organization to meet its goals since it's missing procedures and people.
   Need to understand the technology to see opportunities.
   Value can be found in knowing how the business will develop.
   Value can increase when the users increase.

Chapter 1: information systems and you

Q1: what is an information system?

- A system is a group of components that interact to achieve some purpose, an **information system (IS)** is a group of components that interact to produce information
- Customer relationship management (CMR) systems that use algorithms and databases to predict customer behaviours – all comprise a **five-component framework** of **computer hardware, software, data, procedures, and people**
- Hardware refers to the electronic components and associated gadgetry that constitute a computer system
- Software has occasionally been used to refer to all of the intangible components of a system that were not hardware, but now is mostly just programs or applications

Q2: what is MIS?

- MIS has three key elements: development and use, information systems, and goals and objectives
- Exist to help organizations achieve their goals and objectives. Need to learn to look at information systems and technologies through the lens of business need.

Q3: how does IS differ from IT

- **Information technology (IT)** refers to the methods, inventions, standards, and products. As the term implies, IT refers to raw technology, and it concerns only the hardware, software and data components of an information system and how these are networked together, in contrast IS refers to a system of hardware, software, data, procedures, and people who produce information
- Only when the technology within the hardware, software, and data is combined with the people and procedure components- that IT becomes useful.

Q4: How important are information systems to our economy?

- **Information and communications technology (ICT) sector** provides products and services that other industries, such as retail, manufacturing, insurance, and banking rely on to get their work done.

Q5: how do successful business professionals use information systems?

- Knowing how to use mobile devices and applications is just the first step. The most important task is to understand the technologies and business well enough that you can identify opportunities for innovation through technology
- Important that individuals have a core set of skills to introduce IS systems:
    - Technical skills
    - Specific technology and industry experience
    - Satisfactory communication and other business skills
- Business professionals need to consider IT and IS when they think about the problems and opportunities that confront a department or organization

Q6: what is the shape of things to come?

1. **MOORE's LAW** = the density of circuits (number of transistors per square inch) on an integrated chip is doubling approximately every 18 months.
2. A second major characteristic of IT has been what economists call "network effects" and "lock in" of certain technologies, where the value that is received increases significantly as the number of users increase.
3. The final factors affecting information systems today are the general shrinking of device size (which of course is tied to Moore's law) the tendency for ubiquity or existence everywhere.
4. Wide-area networks (WAN) become cheap, reliable and widely available.

7) What is a marketable skill?

Used to be that one could name particular skills, such as computer programming, tax accounting, or marketing as examples of marketable skills. But today, because of Moore's Law, because the cost of data storage and data communications is essentially zero, any routine skill can and will be outsourced to the lowest bidder.
One has to develop strong non-routine cognitive skills to be more successful and such skills are called marketable skills (Abstract reasoning, systems thinking, collaboration, and ability to experiment).

1. Abstract reasoning is the ability to make and manipulate models. E.g. constructing a model of the five components of an information system.

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

3. Collaboration is the activity of two or more people working together to achieve a common goal, result, or work product. Important skill for effective collaboration is to give and receive critical feedback.

4. Successful experimentation is
    - making a reasoned analysis of an opportunity
    - envisioning potential solutions
    - evaluating those possibilities
    - developing the most promising ones, consistent with the resources you have.

- Fear of failure paralyzes (overcome by having the ability to experiment).

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

Learn how to employ the system to accomplish your goals & have important ancillary functions as well. For example, when using an information system, you will have responsibilities for protecting the security of the system and its data. You may also have tasks for backing up data.

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

Behavior of its users: If the users do not take security seriously, if they do not follow security procedures, then the hardware, software, and data components of the security system are wasted expense.

Chapter 4 – Using Information technology – Hardware and software

What do you need to know about information technology?
To understand technology we need to know how it was before.

Where did all this Information Technology come from?
Early computers ENIAC (1939-1952) came from the United States government.
Mainframes (1952-now) is like a digital computer. Multiprocessing was invented, so many could be on the same server at once.
Microcomputers (1975-now) were a lot smaller then the past devices and easy to hold in hand. This was the beginning of the PC revolution.
Networking personal computers (1985-now) made the world of internet much quicker.

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

Mobile and Tablet computing (late 1990s-now) lead to lower costs and all electronic devices grew common.
Price, performance, small is powerful and *the network* is most important in this evolution.

What does a manager need to know about Computer Hardware
Hardware – is the physical electronic components that input, process and output and store data according to instructions from software or encoding.
A computer consists of:

1. Input (keyboard, mouse, etc)
2. Process (main memory, special functions, etc)
3. Storage (optical disc, etc)
4. Output (video display, printer, speaker, etc)

Binary digits – Computers represent data using bits (0 and 1), grouped into 8 to form a byte.
Computers represent data using binary digits called bits, used for computer data because they are easy to represent physically and electronically.

- Binary notations are sometimes represented through switches. A switch can be either closed or open. open switch = zero / closed switch = one.

- The orientation of a magnetic field is also used to represent a bit; magnetism in one direction represents a zero, magnetism in the opposite direction represents a one.
- For optical media, small pits are burned onto the surface of the disk so that they will reflect light. Reflection = one; no reflection = zero.

All computer data are represented by bits. The data can be numbers, characters, currency amounts, photos, recordings.

- For character data, such as the letters in a person's name, one character will fit into one byte.
- Bytes are used to measure sizes of non-character data as well. For example, a picture of 100,000 bytes in size = the length of the bit string that represents the picture is 100,000 bytes or 800,000 bits (because there are 8 bits per byte).
- The specifications for the size of main memory, disk, and other computer devices are expressed in bytes.
- A kilobyte, abbreviated K, is a collection of 1,024 bytes. A megabyte, or MB, is 1,024K kilobytes. A gigabyte, or GB, is 1,024 megabytes, and a terabyte, or TB, is 1,024 gigabytes.

The *CPU* is the "brain" of the computer where the data transfers from a disk to the main memory, then moves this information from the main memory to the CPU via a data or bus channel. The small amount of very fast memory of CPU is *cache* (large cache is expensive since it's so fast) and CPU speed is measured in Hertz.

Memory swapping – When there is not enough memory to load additional programs in the main memory, the operating system removes some programs/data and replaces it with the newly requested programs/data.
You need to know how much memory you have to buy for your computer.
The cache and main memory is volatile (lose everything if powered off)
Computers can be bought with different types, models, different chips, CPU etc.

What is the difference between a Client and a Server, and What is Cloud Computing?
Client - computers for word processing, spreadsheets, database access, and so forth (Application programs that require programs other than a browser on a user's computer are called thick-clients.) They have software that enables them to connect to a network.
Servers – provide a service like Facebook, Google etc. These need large memory and are often build of many servers.
For some commercial Web sites, the server is actually a large collection of computers, called a server farm, which coordinates all of their activities.
The cloud – Cloud computing is a form of hardware/software leasing in which organizations obtain server resources from vendors that specialize in server processing.

What does a manager need to know about software?

1. Operating systems are programs that control the computer's resources (large programs that control the computers resources, ex: Windows, Linux, Unix (scientific community) and Mac OS)
2. Application software (software that exists for a special purpose, like Microsoft Word.) – Horizontal applications is software that provides capabilities common across all organizations and industries and vertical applications a specific industry, one-of-a-kind applications are developed for a specific purpose.

Often we don't own the programs we use even if we buy them, instead we buy a license to use them.

Virtualization is the process whereby multiple operating systems share the same hardware.
Firmware – software installed in special, read-only memory in devices like printers or communication devices.

What buying decision must a manager make?
A manager for a small or medium size firm must set rules for computer use. In a large company the IS/IT department sets the rules. Also needs to specify the type of applications wanted and operating system.

What are Viruses, Worms and Zombies?
Virus – replicates itself
Payload – the program code that causes unwanted activity
Worm – propagates itself by using the Internet or another network, spreads faster then virus.
Zombie – a computer attached with a virus or a worm.

CH.4 study questions

Q1: why do you need to know about information technology?

- Knowing the basics about modern information technology (IT) (including Hardware software and networking) will not only make you more knowledgeable consumer of technology but also will help you consider how it can be used in business, recognize its positive and negative effects on society and think about what its future could be.

Q2: Where did all this information technology stuff come from?

- The first digital computing devices was made in 1940
- First commercial computer 1950s
- Pc 1980
- Internet and cellular phones come into wide use during the 1990's

Early computers

- **ENIAC** (Electronic numerical integrator and computer), which was originally designed in 1946 to calculate, firing tables for ballistic missiles, was the first reprogrammable general-purpose computer.

Main frames

- The first commercial digital computers, which were large, room sized devices based on now obsolete vacuum tube technology were called mainframes.
- Mainly used by governments and companies
- Second gen mainframes became smaller (1950)
- Third gen mainframes (mid 60's) included operating systems and multiprocessing capabilities

Microcomputers: 1975-present

- By 1981, the microcomputer had developed enough to launch the personal computers

Networking personal computers

- Invention of Local Area Network
- LAN revolutionized business computing by providing shared access to data, printers and other peripheral devices
- LAN was followed up by Wide area networks

Summary

1. Price and performance advances: IT is continuously evolving. According to Moore's law, in 18 months the price of a given integrated circuit (IC) will be halved / for the same amount of money, you will be able to buy a new IC with twice as many transistors
2. Small is powerful: the history of computing can be summarized as an ongoing effort to make IT smaller and more powerful
3. The network thing: the value of IT can be measured not only in the power of the processor but also in the power of the network that can be accessed through the machine

Q3: What does a manager need to know about computer hardware?

- **Hardware** consists of the physical electronic components and related gadgetry that input, process, output and store data according to instructions encoded in computer programs or software.
- All computers consist of four basic components
    - Input
    - Processing
    - Output
    - Storage

1. **Input devices:** may be one of the two most visible or familiar parts of the computer
    - Keyboards or touch screens
    - A bar code scanner
    - Cash register
2. **Processing Devices** include the **Central Processing Unit (CPU),** "brain" of the computer
   The CPU works in conjunction with the computer's Main Memory (RAM= Random access memory)
3. **Output hardware** such as display or monitor, printers and speakers
4. **Storage hardware:** saves data and programs (magnetic disk is the most common storage device, although optical disks such as CDs and DVDs also are popular).

Q4: What is the difference between a client and a server, and what is cloud computing?

- Users employ **client** computers for word processing, spreadsheets, database access, etc.
- **Servers,** as their name implies, provide services.
- Server computers often need to be faster, larger and more powerful than client computers
- Some servers process email, Web sites, large, shared databases. They usually have multiple CPUs. Servers typically have limited video displays. Many servers have no display at all, because they are only accessed from another computer via the network.
- For a large commercial sites, such as Google. The server is actually a large collection of computers that coordinate all activities (called a SERVER FARM)
- **Cloud computing** is similar to the concept of servers that supply applications and data. In cloud computing, customers do not necessarily own the computers they use. Customers pay only for resources used. Major companies that offer cloud-computing products: Amazon.com, IBM, Microsoft, and Oracle.

- The cloud is a metaphor for the internet which makes software and data services available from any location at any time
- It builds on the concept of **Grid Computing,** in which several computers are used to address a single problem at the same time

Q5: what does a manager need to know about software?

- Generally, computer software can be categorized into:
    - Operating systems: tend to be large and complicated programs that control the computer's resources
    - Application software

What are the four major operating systems?

- **Windows** (business users)
- **Mac OS** (MAC OS X, graphic artists & arts community)
- **Unix** (workhorse of the scientific and engineering communities, "more difficult to use")
- **Linux** (version of UNIX developed by the **Open source community.** This community is a loose group of programmers).

Owning versus licensing

- Many people talk about buying software, what is actually purchased is a license to use that program (the right to use a certain number of copies of that program subject to limits on the vendor's liability).
- Large organizations do not buy a license for each computer user. Instead, they negotiate a site license, which is a flat fee payment for the right to install the product (operating system or application) on all of that company's computers or on all of the computers at a specific site.
- In the case of Linux, no company can sell you a license to use it because it's owned by an open source community.

What types of application exist, and how to obtain them

- **Application software:** consists of programs that perform a business function. Some application programs are general purpose, such as excel or word.

What category of application programs exist

- **Horizontal market application:** software provides capabilities common across all organizations and industries
- **Vertical market application:** software serves the needs of a specific industry. Examples: used by dental offices to schedule appointment and to bill patients / used by auto mechanics to keep track of customers automobile repairs / used by parts warehouses to track inventory, purchases, and sales
- **One of a kind application:** software is developed for a specific, unique need.
- For example customer relationship management software is a horizontal application because every business has customers
- **There are also custom developed software.**

What are firmware and utility software?

- **Firmware** is a computer software that is installed into such devices as printers, print servers and various types of communication devices
- The software is coded just like other software, but is installed into special, read-only memory of the device. In this way, the program becomes part of the

device's memory; it is as if the program's logic is designed into the device's circuitry.

- Firmware can be changed or upgraded, normally a task for IS professionals, requires knowledge of special programs and techniques that most business users choose not to learn.
- **The basic input/ output systems (BIOS)** is an important piece of firmware. BIOS is used when a computer is initially started or "booted" up. BIOS is required because all volatile memory is lost when the computer is shut down

What is the difference between thin and thick client

- An application that requires nothing more than a browser is called a **THIN client**
- An application such as Microsoft outlook that requires programs other than a browser on the user's computer is called a **THICK client.**
- **The terms of thin and thick client** refers to the amount of code that must run on a client's computer.

Q6: what buying decision does a manager need to make?

- Business managers also play a role in the specification of client hardware and software for employees whom they manage
- Large organization will have an IS department that is likely to set standards for client hardware and software

Q7: What are viruses, Worms and Zombies?

- **A virus** is a computer program that replicates itself. The program code that causes unwanted activity is called the **payload**. The payload can delete program or data- or even worst modify data in undetectable ways.
- **Macro-viruses** attach themselves to word, excel and other types of documents. When the infected document is opened the virus places itself in the start-up files of the application.
- **Worm** is a virus that propagates using the Internet or other computer network worms spread faster than other virus types because they are specifically programmed to spread. A computer with a worm virus is a ZOMBIE.
- **Botnet**: set of computers and applications that are coordinated through a network and used to perform malicious tasks.

Q8: Briefly describe how a computer works.

- The CPU (central processing unit) is the major actor. To run a program or process data, the CPU first transfers the program or data from disk to main memory. Then, to execute an instruction, it moves the instruction from main memory into the CPU via the data channel or bus. The CPU has a small amount of very fast memory called a cache. The CPU keeps frequently used instructions in the cache.
- Main memory (RAM) of the computer contains program instructions for application programs and a browser. It also contains instructions for the operating system. Main memory is too small to hold all of the programs and data that a user may want to process. Consequently, the CPU loads programs into memory in chunks.
- If the user opens another program or needs to load more data, the operating system will direct the CPU to attempt to place the new program or data into unused memory. If there is not enough memory, it will remove something, and then it will place the just-requested program or data into the vacated space. This process is called memory swapping.

Q9: What are two important software constraints? Explain with suitable examples.

1. A particular version of an operating system is written for a particular type of hardware.
   For example, Microsoft Windows works only on processors from Intel and companies that make processors that conform to the Intel instruction set (the commands that a CPU can process). Furthermore, the 32-bit version of Windows runs only on Intel computers with 32-bit CPUs, and the 64-bit version of Windows runs only on Intel computers with 64-bit CPUs.
2. Application programs are written to use a particular operating system. Microsoft Access, for example, will run only on the Windows operating system. Some applications come in multiple versions. There are, for example, Windows and Macintosh versions of Microsoft Word. But unless informed otherwise it is safe to assume that a particular application runs on just one operating system.

Q10: Differentiate between an operating system and an application program.

- Operating system = program that controls the computer's resources. Functions: read and write data, allocate main memory, perform memory swapping, start and stop programs, respond to error conditions, and facilitate backup and recovery.
- Operating system creates and manages the user interface, including the display, keyboard, mouse, and other devices.
- Makes the computer usable, but does little application specific work.
- To write a document or query a customer database, application programs such as Microsoft Word or Oracle Customer Relationship Management (CRM) are needed. These programs must be licensed in addition to the operating system

Q11: What are the drawbacks of developing custom application software for an organization?

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

Chapter 3 – Productivity, Innovation and Strategy

1) Why should I care about productivity and innovation?

- *Labor productivity* = ratio of the gross domestic product over the total paid worked hours per individual. Principal indicator of capita per income.
- Increases the amount of machinery and equipment (M&E) (particularly in the information and communication technology (ICT) sector) in the economy. Raising the ICT capital intensity means increasing the amount of technology that supports people working.
- Robert Solow "we see computers everywhere except in the productivity statistics" = productivity paradox. No evidence of an increase in worker

productivity associated with the massive increase in investment in information technology.

The **value of IT**:

1. Productivity increase - IT allows a company to create more and/or better output from the same inputs and create them faster than before
2. Structure of competition - IT can alter the way corporations compete
3. Benefits to the end customer - Cheaper & better goods.

2) What is business technology management (BTM) and how is it related to productivity and innovation?

- **ICT industry sector** is an important industry for productivity and innovation because it includes technologies that can enhance individual and organizational productivity
- Canadian policymakers are looking to the ICT industry as a primary driver of innovation and hence increased productivity in Canadian industries
- **BTM is a new program designed by CCICT** (The Canadian coalition for tomorrow's ICT skills, founded by bell Canada in 2007). The CCICT created an industry led group of Canadian employer's educational institutions and industries -> ensure the ability of Canadian organizations to hire ICT professionals for 21st century workforce. = Business technology management (BTM).

3) How do information systems **improve productivity**?

1. Efficiency – business processes accomplished quicker or with less resources/facilities. "doing things right"
2. Effectiveness – new or improved goods/services that the customer values. "doing the right things"

- *Value chain* – network of activities that improves the effectiveness (value) of a service.
- *The margin* – the difference between what the consumer is willing to pay and the cost the company incurs when moving the goods through the value chain. The more value a company adds to a good in its value chain, the higher price it can charge for the final product.
- Michael Porter's **value chain model**:

1. 5 Primary activities –value added directly to the product (ex: shipping materials).
    - Inbound logistics
    - Operations
    - Outbound logistics
    - Marketing and sales
    - Service
2. 4 Support activities – support the primary activities, add value indirectly
    - Firm infrastructure
    - Human resources
    - Technology development
    - Procurement

IT also adds value by adding products to the market that would have been impossible, ex: shipping through the web.

4) How are organizational strategy and industry structure related?

- Organizational strategy reflects company's goals and objectives.

- Porter's Five Forces model: (industry structure where **five competitive forces** determine industry profitability)

1. Bargaining power of customers
2. Threats of substitutes
3. Bargaining power of suppliers
4. Threats of new entrants
5. Rivalry among existing firms.

- Organization responds to its industry structure by choosing a competitive strategy. Porter's **four competitive strategies** model (FIDC):
    - *Cost* (cost leader)
    - *Differentiation* (differentiate product)
    - *Industry-wide* (employ strategy across industry)
    - *Focus* (on a particular industry segment).

5) What is the relationship between innovation and information technology?

- Changes to industry structure often occur through innovation
  Bower and Christensen suggested two general types of **technology innovations**:
    1. Sustaining technologies: changes in technology that improve customer value.
    2. Disruptive technologies: introduce new package of attributes to the accepted mainstream products (can help business alter market structure)

- Theory of the **diffusion of innovation** by Everett Rogers ("the process by which an innovation is communicated through certain channels over time among the members of a social system").
        1. Knowledge (first hear about the innovation)
        2. Persuasion (become interested and find out more about it)
        3. Decision (consider pros and cons)
        4. Implementation (have decided to pursue the innovation)
        5. Confirmation (happy with the innovation, use it to its full potential)

6) How do information systems provide competitive advantage?

1. Through **products and services**:
- Creating new product/service
- Enhance it
- Differentiate it
2. Through **business processes**:
- Lock in customers/buyers (high switching costs)
- Lock in suppliers
- Raise barriers to market entry
- Establish alliances
- Reduce costs

7) Can competitive advantage trough information system be sustained?

- Through patents. The more familiar IT gets the less of a competitive advantage is it.
- Nicholas Carr "IT doesn't matter": hardware and software have become readily accessible to companies.
- However if we consider information systems, the same IT installed in different organizations might result in very different outcomes.
- Long-term competitive advantage lies not with IT but with its integration.

Chapter 2 (PS&I) Business processes, IS and Information

1) What is a business process?

- *Business process* is a sequence of activities for accomplishing a function. (drop a class section)
- *Activities* are tasks within a process (fill out grad forms). Includes *people, data* and *computers*
- An *abstraction* of a business process is techniques for documenting it
- *Role* is activities performed by one *actor.* Actors are people but can also be computers (ex: order tracker)
- *Swimlanes* includes all the activities for one role
- *Repository* is a collection of something (usually a database)

Why standardize business processes?

1. To enforce policies, ex: all orders must be submitted electronically.
2. Produce consistent result, ex: everyone follows same step
3. They are scalable, ex: can be copied and reused.
4. Reduce the risk for errors and mistakes.

2) What is an information system?

A *system* is a group of components that interact to achieve a purpose, *information system* interacts to produce information.

The *five-component-framework:*

- Computer hardware (computer, storage disk, keyboard, monitor)
- Software (Word)
- Data (words, sentences, paragraphs)
- Procedures (steps you take to start the program)
- People

Hardware and people *do things*.

Programs (for the hardware) and procedures (for people) *are instructions.*

Data is *the bridge between* human and machine.

I*nvestments in new information systems.*

3) How do business process and information system relate?

Scope of IS and business processes are different.

4) What is information?

This is *knowledge derived from data.*

Data is fact and figures, it is perceived.

Information is processed *data, data presented in a meaningful context.* It is conceived.

Common elements:

1. Information is more then data (it's meaningful)
2. It varies from person to person
3. Information is in the head of the data user. Two people can interpret data differently (have different information).

5) What factors drive info quality?

Data:

1. Accurate
2. Timely
3. Relevant (to both context and subject)
4. Sufficient (ignore the data you don't need)
5. Easy to use

Human:
1. Knowledge
2. Criteria

6) How do structured and dynamic processes vary?

- *Structured processes* are defined and standardized. Support day-to-day operations.
  Control is critical. Changes are slow and difficult to implement.
  Importance of efficiency (accomplish the process with minimum resources) and effectiveness (process contributes to the organization's strategy).
  Limit what users can do.
  IS prescriptive.
- *Dynamic processes* are informal, less specific, more adaptive and intuitive.
  Adaptation is critical. Process change rapid and expected.
  Importance of effectiveness. Hard to measure efficiency.
  IS supportive.

Chapter 5 (PS&I) – Using IS to improve processes

Process is how organization organizes their work activities.
IS are applied to processes.

1) What are the important characteristics of processes in an organization?

Business processes – activities that accomplish a function
Activity – a task within a business process
Resource – item, people, computers and so on.
Actors – human resources or computer hardware
Role – a list of activities performed by one actor.

Characteristics of processes:

- Stability of flow – structured or dynamic
- Scope
  - *Operational* (routine, everyday work, hard to change, more computers than other processes, high frequency, TPS Transaction Processing System)
  - *Managerial* (allocation and resource use, medium frequency, MIS Management Information System)
  - *Strategic* (broad scope, resolve organizational issues, more people than other processes, low frequency, ESS Executive Support System)
- Objectives – the desirable goal.
  - E*fficient* (creates more output with less/same input)
  - E*ffective* (helps achieve the organizations strategy)

Most common processes: operational with efficiency objectives and strategic processes with effectiveness objectives.

Types of information systems

1. TPS Transaction processing systems – operational (workers)
2. MIS Management information systems – managerial (middle managers)
3. DSS Decision support systems (senior managers)
4. EIS Executive information systems / ESS Executive Support Systems – strategic (executives)

2) What are examples of common business processes?

The value chain – A series of value-adding activities (primary and support activities).

1. *Primary:*
    - Inbound logistic processes - receive, store and disseminate product input (procurement)
    - Operations processes – transform input into output (assemble product, schedule maintenance, open new store)
    - Outbound logistic processes – collect, store and distribute products to buyers (management of finished goods inventory and the movement of goods from that inventory to the customer = sales)
    - Sales and marketing processes – creates the mean for costumers to buy a product (promotions, launch new product)
    - Service process – after-sales support provider (track orders, customer support)

2. *Support:*
    - Human resources processes – assess motivation and skills from workers, create job position; investigate employee complaints; and staff, train, and evaluate personnel
    - Technology development processes – design, develop and test technology in support of primary activities
    - Infrastructure processes – enable day-to-day operations
    - Procurement

3) How can management improve processes?

OMIS Model (objectives, measures, IS)

- *Process objectives:* Specify and improve
  Up to the manager to decide and specify and to make sure they meet the organizational strategy. Classify as effectiveness or efficiency, make explicit, obtain agreement.
- *Process measures* are quantities assigned to attributes (Metrics).
  Reasonable (valid and compelling), accurate, consistent.
- *IS:* implement IS improvements

4) How can IS improve processes?

1. Improve an activity (effectiveness or efficiency)
2. Improve data flow among activities and linkage (impact of 1 activity on another).
3. Improve control of activities (control limits behaviour)

And use of automation (the computer takes over a former human-role).

Non-IS process improvements

1. Add more resources (add drivers)
2. Change process structure (change arrangement of activities within process: remove process *bottleneck* (one activity reduces the overall performance), redesign the process, outsource an activity)

Six sigma – seek to improve process output by removing defects and minimizing variations.

5) How do process teams diagram process improvement?

Improvements always include a team, actors in the process, management, IT analysts and business analysts.

- As-is diagrams: diagrams of the current process (how the process works and what it should look like when finished)
- Ought-to-be diagrams: diagrams of suggestions for improvement.
  BPNM diagrams are usually used.

6) How can IS hinder a process?

- *Information silo:* when data exists in isolated functional IS (because data stored in separate databases) or is duplicated in various files and databases.
  Can make process inefficient, ineffective.
- Why?
  - organizational departments prefer to control the systems they use
  - departments set up their own databases (analyse the costs and benefits of the systems of using their own fairly narrow measures)
  - only when many processes in many departments all rely on the same IS do the savings really accumulate
  - departmental IS is more affordable; enterprise systems can cost as much as 10 to 50 times as much as a single department application
- Fix: Store a single copy of data in a shared database and revise business processes to use that database (feature of the ERP systems).

7) How can SOA improve processes?

Services-Oriented Architecture: new IS approach designed to make it easier to share data amongst process activities. Design in which every activity is modeled as an encapsulated service and exchanges among those services are governed by standards.

- Service: repeatable task a business needs to perform
- Encapsulation: hides data within containers so services can communicate
- Standards: standardized formats for data exchange

Chapter 6 – Supporting processes with ERP systems (PS&I)

ERP is a type of IS system that improves a process across an entire organization.

1) What problem does an ERP system solve?

ERP system has data consolidated in one central database

- *Enterprise application integration (EAI):* provides layer of software to connect information. Cheaper than ERP.
  - Connects information silos via new layer of software
  - Enables existing application to communicate and share data
  - Provides integrated data
  - Leaves department information systems as is but providing an integration layer over the top
  - Enables a gradual move to ERP

- *Enterprise resource planning (ERP):* Creates a single database and provides processes that are integrated with each other. Increases *purchasing process, standardization*, and gives us *bargaining power* over suppliers.
  - Single consistent IS
  - Integrate process data from departments such as accounting, human resources, sales and operations into a single system
  - By consolidating the data in one place, the data are always up to date and available in real time to be used by any process in the organization
  - Costs are reduced.

2) What are the elements of an ERP system?

Current ERP systems are particularly strong in the areas in which they were first developed, such as manufacturing and supply process

- Material requirements planning (MRP) to efficiently manage inventory, production, and labour.

- Manufacturing resource planning (MRPII) added financial tracking capabilities as well as the opportunity to schedule equipment and facilities.
- JUST IN TIME (JIT) synchronizes manufacturing and supply - manufacturing occurs just as raw material arrive
- The Sarbanes Oxley act (SOX) required companies to exercise greater control over their financial processes, and ERP systems addressed that new requirement

An ERP system must be able to integrate processes of:

1. Supply chain management (SCM)
2. Manufacturing (MRPII, JIT)
3. CRM – customer relationship management
4. Human resources
5. Accounting

The five components of an ERP:

1. Software – uses *configuration/customization* to meet customer requirements without changing program code. ;
2. Data – Database design & initial configuration data. Doesn't contain company's actual operational data. ERP collaborates with DBMS (create, process and administrate) to update data in the database. *Transactional data* (data for an event), *master data* (doesn't change from transaction to transaction) or *organisational data* (ex: location of warehouses)
3. Hardware – Each ERP needs storage, clients, printers, cables, scanners, etc.
4. Procedures –instructions & methods for users to interact with the application. Gives control over a process. Expensive & timely (training required).
5. People – *Users* (the one using the ERP, implementing the system), *IT analysts* (supports, maintain and adapt the system after implementation) or *consultant* (work for another part and helps implement the system, budget and plan).

Inherent process: ERP also specify specific processes for the implementing organization.

3) What are the benefits of an ERP system?

- Implement processes that are industry best practices, inherent processes that integrate well the main benefits
- Real-time data sharing (see trends and respond quick)
- Management more insightful and provides better oversight
- *Information silo* problem is solved (departments no longer create and maintain their own purchasing database)

4) Challenges of implementing ERP

Not done well the losses can be huge since the process is long and expensive.
Challenges:

1. Implementation decisions:
    - Select the right ERP vendor (long term relationship)
    - Gap between the ERP system and the business requirements from strategic planning (what should the ERP do?)
    - Configuration (bill of material (specify the raw material), order size, tracking of material and so on)
    - Data issue comes with different formats
    - Cutover pressure is the transition period
2. People challenges:
    - Work is changed
    - Top management involvement after initial decision to implement (should be frequent)

- Management oversells capabilities – don't oversell the vision of what the system might do
- Perceived threat to department autonomy, avoid collab breakdowns
- Failure to specify objectives & measures for new processes

ERP upgrades often encounter *resistance* and *surprise.* Try to *justify* the upgrade. Be aware of the lock in of a *customization* of the ERP. There should be a *long-term strategy* for upgrades.

5) What types of organizations uses ERP?

1. ERP by Industry type – Manufacturers in aerospace, automotive and industrial equipment have an effective use of ERP.
   - Manufacturing
   - Distribution
   - Mining, materials extraction, petroleum
   - Medical care
   - Government & public service
   - Utilities
   - Retail
   - Education

2. ERP by Organization size - range from all sizes: small, midsized and multibillion dollar ones. Key difference is the availability of skilled businesses and IT analysts that allow them to implement the systems better.

3. International ERP – designed to work with multiple currencies, manage international transfers of goods and inventories, work effectively with international supply chains.

6) Who are the major ERP vendors?

Comprehensive ERP systems support the major processes in business.
ERP products:

1. SAP: offers the most extensive ERP products, largest customers
2. Oracle : combo of in-house and acquired products. Intensely competitive company w/ strong technology base, large customer base.
3. Infor: privately held corporation that has acquired ERP products (Baan). Many solutions.
4. Microsoft Dynamics: 4 products acquired by acquisition (AX, Nav, GP, Solomon). Not well integrated with Microsoft Office. Uncertain product direction.
5. Epicor: strong industry specific solutions (retail). Configurable, cheaper.

7) What makes SAP different from other ERP products?

System, applications and products

- Offers training and consulting within its services
- The price varies because it sometimes takes several years to set up an ERP system
- Can speed up the process w/ industry-specific platform.
- Training for the employees are a long process.

SAP modules

- QM – quality management
- FI – Financial accounting
- PP – product planning
- CO – controlling

- HR – human resources
- MM** - materials management
- SD* - sales and distribution
- PM – plant maintenance
- PS – project systems
- BI – business intelligence

SAP business suite
- SAP ERP
- SAP CRM
- SAP SRM
- SAP SCM
- SAP NetWeaver

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. Main activities: Order, receive, pay. Goals: save time and money.
  Examples:
  - Inbound logistics (create procurement)
  - Operations
  - Sales and marketing
  - Customer service
- Purchase order: Written document requesting delivery of a specified quantity of a product or service in return for payment.
- Types of inventory:
  - Raw materials inventory
  - Finished goods inventory

2) How did the procurement process work at CBI before SAP?

Before: had the responsibility to order, stock and plan and manage people.
Objectives: don't run out of material, use reliable suppliers and stay within budget.
Lead time is the time for a supplier to deliver an order.
Had to go into different databases to control the ordering process, see the stock etc.

1. Invoice (itemized bill): Amount due and the purchase order number.
2. Three-way match: Making sure that the data on the invoice matches the data in the purchase order and goods receipt.

- Six Roles
  - Two performed by people: Warehouse Manager and Accountant
  - Four performed by separate computer applications with separate databases (DB): Sales DB; Purchase Order DB; Warehouse DB; and Accounting DB.
- Information system silos

3) What were the problems with the procurement process before SAP?

- *Warehouse problems:*
  - Growth in finished goods inventory reduces warehouse space for raw material inventory.
  - Warehouse manager doesn't have data on sales price discount (didn't know if a spike in sales were due to discounts).
- *Accounting problems:*
  - 3-way match discrepancies take time to correct.
  - Time delays in updating accounting data

- *Purchasing problems:*
  - Purchasing agents not centralized.
  - Training, experience and motivation differences.
  - Errors in data entry
  - Weak internal controls (pressure for greater financial controls)

4) How does CBI implement SAP?

Strategy examination process:

1. Use Porters' five forces to determine the structure of the industry
   - Bargaining power of customers
   - Threats of substitutes
   - Bargaining power of suppliers
   - Threat of new entrants
   - Rivalry
2. Commit to specific competitive strategy
3. Develop objectives and measures for processes to support the competitive strategy:

   Efficiency:
   - Smaller finished goods inventory
   - Reduce administrative time
   - Fewer errors

   Effectiveness:
   - Better financial control
   - More responsive to customers

5) How does the procurement process work at CBI after SAP?

- Maintained same three major activities - Order; Receive; and Pay
- Single shared database
- Solutions to prior problems
  - *Purchasing:* each order will be seen and shared with the suppliers.
    - New purchasing department centralized purchasing activities
    - Data entered in a single, shared database
    - Automated internal company document Purchase Requisition (PR) - Easy conversion of PR's to Purchase Orders
    - Reduces errors
  - *Warehouse:* Goods are received. Immediate update to storage database.
    - Goods receipts entered into same database as PO's
    - SAP verifies the goods received against the PO
    - Immediate update to inventory
    - Accounting impacts automatically updated in the same database
  - *Accounting:* Can see at once if invoice matches PO (purchasing order)
    - Three-way match completed by SAP
    - Less labor intensive
    - Incoming invoices are compared to PO and Goods Receipt for verification
    - Payment simplified
    - Accounting updated automatically in SAP

Supply chain gains from this since the lead time to costumers is faster, product variety can increase and less stock outs.

Benefits:

- Single database
- Shared information in real time

- Reduction of errors
- Improved financial controls
- Increased responsiveness

6) How can SAP improve supply chain processes at CBI?

Supply chain processes:

- *Supplier relationship management process* – automates, simplify and accelerate a variety of supply chain processes (reduce procurement costs, build collaborative suppler relationships, etc.) (operational)
- *Returns management process* – manage returns of faulty products. (managerial)
- *Supplier evaluation process* – determine criteria for supplier selection. (strategic)

Supply chain process integration:
Supply chain management – integration of the supply chain processes (design, plan, execute, integrate). Improved by sharing data between processes and increasing process synergy (processes mutually supportive).

Bullwhip effect: company orders more material than needed due to sudden change in demand.
Bottleneck effect: limited resources greatly reduce the output of an integration series of activities for processes.

7) New IS: Procurement process with emerging technologies

- Augmented Reality (AR): computer graphics and data are overlaid into physical environment.
- Radio-frequency identification (RFID): Used to identify and track items in the supply chain. Chips, broadcast data to receivers that can display and record the data.
- Sensors
- Robotics
- 3D printing technology.

Chapter 5 – Database and Content Management
1) What is content?
Content is related to intellectual property. It is a form of creative endeavour that can be protected through a trademark, patent, copyright, industrial design, or integrated circuit topography. It varies by industry.
Organizations may store data, documents, spreadsheets, presentations, web pages, text from blogs, Twitter, or discussion boards, graphics, video files and video logs, audio files, etc.

2) How can content be organized?
Content management includes:

- management of content data
  - efficient and effective storage and processing of bytes
  - handled by *database management systems (DBMS*), isn't enough today
- presentation of content

content management system (CMS) helps companies organize the presentation of content. Doesn't just organize documents, CMS seeks out documents across the whole organization and gives access to this content.

3) What is the purpose of a database?
A database keeps track of things: a self-describing collection of integrated records. Spreadsheets keep lists of single concepts / Databases keep lists involving multiple themes.

4) What does a database contain?
Hierarchy of data elements:

1. *Byte* is a character of data (8 bits)
2. Bytes are grouped into *columns/fields*
3. Columns grouped into *rows/records*
4. Rows are grouped into *tables/files*

Database – a collection of tables plus relationships among rows.
Metadata – describes the structure of the database, data that describes data (makes database more useful than spreadsheet and easier to use).
Key – used to express a column that identifies a certain row in a table. Every table has a key.
Foreign key – keys in a different table than the one in which they reside.
Relational database –database using tables and represent relationships using keys and foreign keys.
A database is *self-describing* this means that it contains a description of its own content (metadata).

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

- A database itself is not useful, you need a *database application system* to make is accessible and useful.
- DBMS (database management system) – a program used to create, process (delete, modify, read or insert data) and administer (ex: set up security, backups etc.) a database. Licensed from vendors.
    - Open source: Microsoft, Oracle, IBM, MySQL
    - DBMS products – DB2 from IBM, Access and SQL Server from Microsoft, Oracle from Oracle Corporation, MYSQL – an open source DBMS
- User – Database application – DBMS – Database

1. **Creating** the Database and Its Structures
    - Use the DBMS used to create tables, relationships and other structures in the database
    - Use to define a new table or modify tables
2. **Processing** the Database
    - DBMS processes database
    - Applications use DBMS to read, insert, modify, or delete data
    - *Structured Query Language (SQL*)= international standard for processing a database
3. **Administering** the Database
    - DBMS provides tools to assist in administration of database
    - Can be used to set up a security system
    - Used to back up data
    - Add structure to improve performance
    - Remove data

6) What is a database application?

- A collection of forms, reports, queries and application programs that process a database.
  Databases can have more than 1 application and each application can have multiple users.
- Forms, reports, queries all work for standard functions
  - *Forms* – used to modify, delete, read and insert data.
  - *Reports* - show data in structured context, may compute values
  - *Queries* - means of getting answers from database data
- Application programs
  - process specific logic to business need
  - enables database processing over Internet
    - serves as intermediary between Web server and database
    - responds to events
    - reads, inserts, modifies, deletes data
- *Multiuser processing* – multiple people use a database. Problems: *lost-update* when two users use a database and the database updates wrong, inaccurate results.

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

1. Enterprise DBMS
   - process large **organizational and workgroup databases**
   - **many users, many database applications**
   - DB2, Microsoft's SQL server, Oracle
2. Personal DBMS
   - designed for **smaller, simpler database applications**
   - **fewer than 100 users**
   - Access, dBase, FoxPro, Paradox, R:Base

Application extension 5A

1) Who will volunteer?

Find & track volunteers (how many years they'll come back, their effectiveness and personal info)

2) How are database application systems developed?

- Database application system consists of:
  1. Database
  2. DBMS
  3. One or more database applications

- Database application consists of:
  1. Forms
  2. Reports
  3. Queries
  4. Application programs

- Database Application Development Process

1. Developers interview users to find the requirements
2. Analyze existing reports, forms and user activities.
3. Summarize requirements in a *data model* (a summary of the data : entities & relationships)
4. Create database design (tables with foreign keys)
5. Design implemented in database
6. Database filled with user data

3) What are the components of the Entity-relationship data model?

- Techniques for creating data model
  - Entity-relationship data model (E-R)
  - Unified modeling language (UML)
- E-R model components
  - *Entities* (things) stored in database, something a user want to track (Physical object or logical construct/transaction: customer, salesperson, item, order, contract).
  - *Attributes* describe the characteristics of entities
  - *Identifier* is an attribute whose value is associated with ONE entity.
  - All entities have *relationships* among them. (*Crow's foot* – the lines between entities.)
    - 1:1 relationship (single entity to single entity)
    - 1:N relationship (one-to-many entities)
    - N:M relationship (many-to-many entities)
  - *Cardinality* - # of entities that can be involved in relationship (maximum vs minimum)

4) How is a data model transformed into a database design?

Database design is the process of converting data into tables, relationships and data constraints.

1. Transforms entities into tables
2. Expresses relationships
3. Defines foreign keys
4. Shows data constraints

2 concepts:

1. Normalization:

   The process of converting poorly structured tables into well-structured tables.

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

   Normalizing for Data Integrity
   - Eliminate data duplication
   - Slower to process
   - Construct tables such that every table has single topic
2. Representing relationships:
   - Designer creates table for every entity
   - Entity identifier becomes primary key of table
   - Attributes of entity become columns
   - Represent relationships between tables, add foreign key to one or more tables

5) What is the users role?

- The ones deciding what the database should contain
- Change the database while in the modelling state, later will only be time consuming
- Must insure that model reflects an accurate view of business.

6) So how will volunteer?

A database must reflect the way users think about their activities.

- Consultant creates data model based on interviews with users

- Data model reviewed and approved
- Database tables constructed
- Primary and foreign keys selected based on interviews
- Microsoft Access database created
- Relationships indicated
- Forms and reports constructed.

Application Extension 5B – Using Microsoft Access
How do I create tables?
The primary key is underlined and the one in *italic* is the foreign key.
They go through an example using the "volunteer" business.
Be clear with the naming of different columns etc.
You can follow the steps using your own Microsoft Access.

Chapter 6 – Networks and collaboration (E-Mis)
1) Why should I care about networks?
Computers are more useful to us when we can connect them to a network to collaborate.
Internet: network of networks containing millions of computers.

Collaboration occurs when two or more people work together to achieve a common goal, result or product. Involves coordination, communication and often computer networks.
Effectiveness is driven by:

1. Communication skills and culture
   ability to be a part of a group and to give/receive critical feedback
2. Communication systems
   Important to work together since you can't be at the same place at the same time (Email, virtual private networks, IM). Are dependent on the network technology available in organization.
3. Content management
   Multiple users are contributing and changing documents, schedules, task lists and assignments it is crucial to keep track of tasks.
4. Workflow control
   Process or procedure by which content is created, edited, used and disposed of.

2) What is a computer network?

- *Network Externality/ Network effect*: The larger the number of people using a network, the more valuable that network becomes (network growth can lead to congestion pbs or saturation of market).
- *Network*: collection of computers that communicate with one another (transmit / receive electronic signals through transmission media).
- *Transmission media*: Physical media (copper cable and optical fibre) or wireless media transmitting light or radio frequency.
- Main networks:
  a. *LAN* (local area network): Computers connected at a single physical site.
  b. *WAN* (wide area network): Computers connected between two or more separate sites. Use communication networks from vendors (licensed by govt).
  c. *Internet*: Network of networks. Connect LANs, WANs & other internets.
- *Protocol* – used for two devices to communicate (must be the same).

Internet used for emailing and web browsing / internets are private networks of networks

3) What are the components of a LAN?

All computers are owned by the business itself.

- *Switch* – a special-purpose computer that receives and transmits messages on the LAN
- *Network interface card* – a hardware component for the computer, printer etc. connection to the network cable. (Today we are often wireless)
    - *Media access control (MAC) address* – is the unique identifier
    - Most connections now use *UTP/unshielded twisted pair cables*.
- IEEE (Institute for Electrical and Electronic Engineers)
    - *Ethernet protocol standard / IEEE 802.3*
        - 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)
    - *Wi-Fi / IEEE 802.11* protocol
        - Wireless LANs: computer network that allows users to connect without using a network cable
        - Wireless NIC (WNIC)
        - or WNICS connect to Access Point (AP). AP processes both standards.

4) Why is mobile computing important?

Mobile devices built for communication and collaboration.

- *M-commerce* allows new transactions through your phone. (E.g. mobile banking, mobile ticket purchase, etc.)

- Smartphone : 3G is a group of standards for wireless communications. Provides higher transfer rates & allows for simultaneous use of voice and data transfer.
- Smartphones have different operating systems (Blackberry OS (RIM), IPhone OS (Apple), Windows Mobile (Microsoft), Android and Linux).
  Different systems work differently, ex: Apple can synchronise ITunes over multiple devices.

- Issues with tablets and eReaders: Support, security, complexity in synchronizing and ownership is hard to deal with.

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

Internet is a WAN.

Cable connections made through licensed communications companies.

- A *router* implements the protocol for WAN.
- *Internet service provider* (ISP) has 3 functions:

1. Provides you with a legitimate Internet access (IP address)
2. Gateway to internet
3. Pay for the Internet

- *Hypertext transfer protocol (HTTP*) enables communications among programs
- *Top -Level Domains (TLD*): .com .org .ca
- *Uniform Resource Locator (URL*): website address
- *IP address:* numbered address for each machine connected to the network. All are unique and private (private network) or public (Internet).

- *Domain Name System (DNS*): converts human-friendly URLs into computer-friendly IP addresses. -> Domain name resolution process, performed by domain name resolvers.

3 ways to connect Home and small-business computers to an ISP:
- Regular telephone line
- Digital subscriber line (DSL): Special telephone line.
- Cable TV line

Modem converts signals from analog to digital.
Require that digital data be converted into analog (wavy) signal before being sent. When received, analog must be converted into digital signal before computer can read it.

Types of modems:
1. *Dial-Up* modems: over regular telephone lines, interfere w/ voice telephone service
2. *Digital subscriber lines (DSL)*: operates on same lines as voice telephones & dial-up modems, but do not interfere with voice telephone service. Faster data transmission. Connection always maintained.
    - Asymmetric DSL (ADSL): Faster download than upload
    - Symmetric DSL (SDSL): Fast download and upload
3. *Cable modems*: use cable TV lines. High speed data transmission, doesn't interfere w/ TV transmission, connection always maintained.

Transmission speeds:
- Narrowband: Transmit speeds less than 56kbps (Dial-up)
- Broadband: Transmit speeds more than 256kbps.

- *Wireless WAN* uses a larger area and cellular networks to transfer data. Connect via radio waves.

<u>6) How does Email actually work?</u>
Networks layers.
Layer 1 – NETWORK ACCESS LAYER (transmit data within a single network, LAN).
Layer 2+3 – used to transmit data across an internet (IP, TCP). INTERNET LAYER & TRANSPORT LAYER.
Layer 4 – APPLICATION LAYER (programs for mail, web browsing, file transfer. Provides protocols that help diff. applications interact w/ each other & the person using the computer).

Emailing steps:
1. Getting internet access and pressing "send/receive"
   Search for a server and this is Layer 1.
   The Email program is on Layer 4 (simple mail transfer protocol SMTP).
2. Break apart the message and get ready for transport
   Layer 3, the TCP (Transmission Control Program)
3. Send and receive packages
   TCP interacts with protocols at Layer 2 (Internet protocol IP).
   Route the message across in routers.
4. Reassemble packages and display message
   At the right router the message is sent off to the mail server. TCP unpacks it when all the parts have arrived.

<u>7) What are Firewalls, Encryption and VPNs?</u>

1. *Firewall:* computing device that prevents unauthorized network access (special purpose computer or program).
    - *Port* is a number that is used to unique identify a transaction over a network.
    - *Access control list (ACL):* encodes rules stating what packets are allowed/prohibited.
    - *Multiple firewalls*: perimeter (sit outside organizational network), internal (inside network), packet filtering firewall (examines source's address, destination address, etc.).
2. *Encryption:* transformation of clear text into coded text for safe storage & communication.
    - *key* is a number used to encrypt data
    - *encryption algorithm* used to code/decode messages
    - types: symmetric (same key to code/decode), asymmetric (diff. keys used to code/decode). Symmetric is easier and faster.
3. *Virtual private network (VPN):*
    - Uses Internet or private internet to create appearance of point-to-point connections
    - Uses public Internet to create appearance of private connection
    - Client and server have point-to-point connection through *tunnel* (private pathway over shared network)
    - Secured, encrypted communications.

8) How does a search engine work?

Tool to search info on the Internet.

- Require:

1. A way to collect URL's
2. A method for storing/assessing the URL so they can be searched.

- *Web crawler* finds the URL (a software program). Can collect websites, Email, text and images. Once a URL is identified it gets organized (search engine indexing).
- Two important factors:
    1. The breadth of coverage (the % of the Web covered by search engines)
    2. The ordering of results from a search.

  But the match depends on the criteria used.

Chapter 9 – E-commerce, Social networking and Web 2.0

1) What is E-commerce and how is it used?

= Buying and selling transactions over public and private computer networks.

- Technology perspective:
  Need for additional infrastructure
- Government perspective
  Coordination for smooth business operations
  Importance of security

1. *Merchant companies* – take title to goods they sell
    - B2B
    - B2C
    - B2G (govt)

  Ex: Dell has reduced their order time and costs by making their webpage available for B2B, B2C and B2G.

2. *Nonmerchant companies* – arrange for the purchase and sale but don't own the goods.
    - Auctions (match buyer w/ seller. e-Bay)
    - Clearinghouses (provides goods and services at a stated price and arrange for the delivery of the goods. Amazon)
    - Exchanges (Priceline.com)

Disintermediation – Removal of intermediaries between parties (middle men such as wholesalers, distributors or retailers were replaced with the internet). Results in higher revenues for manufacturers and lower consumer prices.

Price elasticity: Measures how much demand rises or falls with changes in price.
You should manage prices directly with consumers not with competitors.

- Economic challenges with E-commerce:
    1. Channel conflict
    2. Price conflict
    3. Logistic expenses – existing distribution and retailing partners are pressuring down these expenses.
    4. Customer services expenses
    5. Showrooming - customer learns about / tries a product or service in the high cost bricks-and-mortar retail store, while completing the sales transaction at low-cost internet sales channel of another retailer
    6. Taxation – different provinces have different taxes, so the government has trouble finding how to tax e-commerce accordingly
    7. Reduced profitability and margin squeeze – Pressure for low prices, since the information is open to everyone.

2) What is social networking and how is it enabled and affected by IS/IT?
Social Network: Is a structure of individuals and organizations that are related to each other in some way.
Social networking is the process by which individuals use relationships to communicate with others in a social network.

Business literature defines three types of capital:

1. *Physical capital*: investment of resources for future profit. Traditional definition refers to investments in physical resources, such as factories, machines…
2. *Human capital*: investment in human knowledge and skills for future profit.
3. *Social capital*: investment in social relationships with expectations of returns in the marketplace. Social capitals adds values in four ways:
    a. *Information* (about alternatives, pbs, opportunities…)
    b. Influence
    c. *Social credentials* (qualities, achievements, experiences that make someone suitable for something)
    d. Personal reinforcement

According to Henk Flap, social capital is measured by the number of relationships in a social network, by the strength of those relationships, and by the resources controlled by those related.
Strong relationships create the most social capital in a social network.
Weak relationships contribute to the growth in social networks. *Weak tie* = the people you know the least but they contribute the most to your network.

- How has networking been enabled by technology? Besides the ubiquity of computers, and the relative low cost, three other considerations are:
    - Improved search capabilities
      Quickly sort through large amounts of data and find the specific people or relationship that we are interested in

    - Reduction in the trade off of richness and reach
      The ability to keep track of many more people and enhance personalization

    - Network effects
      As a network grows, the benefit or utility that each person adds tends to increase. This can accelerate the speed at which networks grow and how useful they become.

3) What is web 2.0?
Describe applications and platforms on the web. Tim Reilly
Ex: Google, Amazon, EBay.

- Provide *software as a service (SAAS*), ex: you access your Google mail through a thin-client browser where the process is done "in the cloud" (Internet).

Thin clients don't need any installation on a users' computer. Software as a service clutches' with the software program such as Microsoft, Oracle or SAP, their product is the software.

- Use increases revenue
    - *Extent of network effects* - value of site increases w/ number of users
    - *UGC (User generated content)* – content that is contributed by users (*viral marketing* = method of product promotion that relies on getting customers to market an idea, product, service on their own by telling their friends about it, usually by e-mail)
    - *Crowdsourcing* – customers provide customer support to one another (reviews)

- Businesses benefit from Web 2.0

- *Advertising* (want to be 1st on google when ppl search shit related to your shit)
- *Mashups* – the result of the output from two or more websites is combined into a single user experience (google's My Maps or watch a movie, see candy and there will be an ad from IGA)
- *Viral marketing* – new product features are released and vendors wait for users to spread the news to one another, one friend sending a message to many friends; most of whom send that message, in turn, to their friends; and so forth.

3 pillars of sociability

- *Affiliation* – ensure that users want to be affiliated w/ your group (need to belong)
- *Participation* – make sure they understand the rules of behaviour and conduct. Most successful social networking sites ensure an "invitational desgign" (finding online ways to welcome new ppl into a group & making it safe for them to learn & master the norms)
- *Validation* – consider how to validate the user's social experience, reinforcing the social utility of the website.

4) Is there a Web 3.0?

The first use of new technology almost always mirrors the old technology.

Chapter 10 – Acquiring information systems through projects

1) How can information systems be acquired?

- Buy it and use as is
- Buy it and customize it
- Rent or lease it
- Build it yourself
- Outsource it (hire other company to build/maintain it for you)

2) What are IT projects, and what does PMBOK means

Project management body of knowledge (PMBOK) – project "consists of a temporary endeavour undertaken to create a unique product, service, result".
Usually start with set of goals or objectives, scope, start & end date.

IT projects have a large information technology component (installation of new email application, CRM system, Enterprise resource planning system (ERP). Affect people, data, processes.

Information technology project management (ITPM) – is the collection of techniques and methods that project managers use to plan, coordinate and complete IT projects.

5 process groups in any projects:

1. Initiating
2. Planning
3. Executing
4. Controlling and monitoring
5. Closing

Each of these can be linked to a project knowledge area:

1. Integration management
2. Scope management
3. Time management

4. Cost management
5. Quality management
6. Human Recourses management
7. Communication management
8. Risk management
9. Procurement management

A crucial skill for a project manager is *communication.*

3) What should you know about IT operations and IT projects?

a. IT Operations:
   - Service, maintenance, protection, and management of IT infrastructure
   - Maintain

b. IT Projects:
   - Renewal and adaptation of IT infrastructure is normally accomplished through projects
   - Change

Information technology infrastructure library (ITIL) – a set of best practises approaches to IT operations.

4) Why are IT projects so risky?

1. Most IT project definitions not easy to graphically represent.
2. Lack of good model is important risk
3. Good estimates difficult to develop because the technology is continually changing. Ex: computer gets cheaper but databases more complex.
4. Being able to monitor progress is a challenge.
5. Lack of experience, lack of top management support, lack of patience from users, unclear goals etc. are also a part of the risk.

5) What is an SDLC?

System development life cycle (SDLC) - process used to acquire information systems.

5 steps:

1. System definition
   A) Define the goals and scope of the new information system using the support of business processes and decision-making.
   B) Assess feasibility, Cost, schedule, technical and organizational

- Requirements analysis to form project team (manager, system analysts, programmers, software testers, users) and develop requirements.

3. Component design (business analysts and system analysts)
   A) Determine hardware design (project team)
   B) Determine software design (source: off-shelf, w/ alterations or customization)
   C) Design database
   D) Design procedures
   E) Create job definitions (if new jobs are created).

4. Implementation

Building, testing and converting the users to the new system.

A. build system components
B. conduct test unit
C. integrate components
D. conduct integrated test

E. convert to new systems

Testing

Test plan consists of sequences of actions that users take when using the new system.
PQA Product quality assurance consists of constructing the test plan with the advice and assistance of users.
Beta testing – process of allowing future system users to try out the new system on their own.
System conversion is when the system gets installed.

Four ways:

A) Pilot – implements entire system in a limited portion of the business. (If system fails, will be contained in a limited boundary.)
B) Phased – installed in phases across the entire organization
C) Parallel – runs in parallel with the old, until new system is tested and fully operational.
D) Plunge – shut down the old system and starts the new one.

5. System maintenance

Repair, add new features, maintain

Difficulties:

- *Waterfall method* is one of the problems with SDLC since a process cant work this smooth (one step to another and so on)
- Difficulty in documenting requirements
- Scheduling and budgeting difficulties.

7) What is outsourcing and what are application service providers?
Outsourcing is when you hire another organization to perform a service.
Offshoring is when you outsource and the vendor is overseas.
Benefits: Cost reduction, gain expertise and reduce development risks.
Risks: Loss of control over the project, long term costs and ending the agreement (this is not easy – expensive to change vendor).

Application service providers (ASP) are a form of outsourcing; you rent applications.
-> Organization contracts with a vendor to "rent" applications from the vendor company on a fee-for-service basis.
Vendor maintains the system at its own web location and the client organization accesses the application on the vendor's website.

Chapter 11 – Structure, governance and ethics
1) How is the IT department organized?
IT services is the department of people that provide IT.

- *Chief Information Officer (CIO*): head of IT department. Reports to the CEO, though sometimes these executives report to the chief operating officer (COO) who in turn reports to the CEO.
- *Chief Technology Officer (CTO*): Sorts though new ideas and products to identify those that are most relevant to the organization. Requires deep knowledge of information technology and the ability to envision how new IT will affect the organization.
- Third group in the IT department is *development*: manages projects that acquire new information systems & existing information systems. Staffed by business analysts or system analysts who work with users, operations and vendors to

acquire and install licensed software and to set up the system components around that software.
    - Normally involved in developing the business case for a newly purposed system as well as the requirements for that system.
    - System analysts are normally involved in designing and implementing the new system.
- The last department is *outsourcing relations*. Exists in organizations that have negotiated outsourcing agreements with other companies to provide equipment applications or other services.

2) What about the web?

Web design project usually consists of the following people:

- *Project manager*: Responsible for interacting with the client and moving the project successfully toward completion.
- *Lead designer/analyst*: Responsible for understanding the clients needs and developing the overall look and feel of the site.
- *Developer*: Responsible for taking the design and creating the functioning site.
- *Technical architect*: Responsible for making decisions about technical issues related to the site, including server/browser support…

3) What jobs exist in IT services?

You must have interpersonal (communication and leadership) and technical skills. All positions require business knowledge as well.

Ex: Website designer, technical writer, salesperson, project manager, developer etc.

4) What is IT architecture?

- *IT architecture:* basic framework for all the computers, systems, and information management that support organizational services.
- Includes diagrams, management policies (security, privacy etc.) and discussion of future changes.

- *Enterprise architect*: creates a blueprint of an organizations information system and the management of these systems.

- *Zachman framework*: developed by John Zachman in the 1980s, the framework divides the system into two dimensions: One is based on six reasons for communication and the other is based on stakeholder groups (planner, owner, designer, builder, implementer, and worker)

	What (Data)	How (Function)	Where (Locations)	Who (People)	When (Time)	Why (Motivation)
Scope {contextual} Planner	List of things important to the business	List of processes that the business performs	List of locations in which the business operatses	List of organizations important to the business	List of events/ cycles important to the business	List of business goals/strategies
Enterprise Model {conceptual} Business Owner	e.g. Semantic Model	e.g. Business Process Model	e.g. Business Logistics System	e.g. Workflow Model	e.g. Master Schedule	e.g. Business Plan
System Model {logical} Designer	e.g. Logical Data Model	e.g. Application Architecture	e.g. Distributed System Architecture	e.g. Human Interface Architecture	e.g. Process Structure	e.g. Business Rule Model
Technology Model {physical} Implementer	e.g. Physical Data Model	e.g. System Design	e.g. Technology Architecture	e.g. Presentation Architecture	e.g. Control Structure	e.g. Rule Design
Detailed Representation {out-of-context} Subcontractor	e.g. Data Definition	e.g. Program	e.g. Network Architecture	e.g. Security Architecture	e.g. Timing Definition	e.g. Rule Definition
Functioning System	e.g. Data	e.g. Function	e.g. Network	e.g. Organization	e.g. Schedule	e.g. Strategy

5) What is alignment, why is it important and why is it difficult?

Alignment – matching organizational objectives with IT architecture.

This is an ongoing process.

- Measured as the degree to which the IT department's missions, objectives, and plans are overlapped with the overall business missions, objectives, and plans.
- Communication between business and IT executives is the most important indicator of alignment.

6) What is information system governance?

Governance: development of consistent cohesive management policies and verifiable internal processes for information technology and related services.

Goal: to improve the benefits of an IT investment (stakeholder value) over time.

- Better service quality
- Reduce service costs and delivery time
- Reduce IT risks
- Alignment w/ business processes

Laws:

1. *The Sarbanes-Oxley act* (public companies)
2. *Bill 198, Budget measurement act*

Laws which force companies to comply with governance standards for collecting, reporting and disclosing information. Require management to create internal controls sufficient to produce reliable financial statements and to protect the organization's assets.

7) What is an information system audit and why should you care about it?

Audit - an examination and verification of a company's financial and accounting records

Information system audit – focus on information resources that are used to collect, store, process and retrieve information.

To verify the organizations procedures and policies.

- *Information Systems Audit and Control Association (ISACA*): An organization that was formed in 1969 by a group of individuals who were in charge of auditing controls for newly developed computer systems.

- *Certified Information Systems Audit (CISA*): A certification that is recognized globally and has been earned by more that 90 000 professionals.

- *Control objectives for information and related technology (COBIT*): A framework of best practices designed for IT management.
  Provides board members, manager, auditors and IT users with a set of generally accepted measures, indicators, processes and best practices to assist them in getting the best from their organizational IT investments.

Why should you care?

- Increased need to report and disclose IS operational information will require employees at all levels of an organization to become more familiar with the issues facing information technology management.
- Senior business managers are required to make assertions about the controls on IS that will expose them to both financial and criminal penalties.

8) What is information system ethics?

About the people involved in the system

About understanding *our* behaviour (how we think and act in situations and how this affects others).

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

9) What is green IT and why should you care about it?

Green IT: using IT resources to better support the triple bottom line for organizations.

- Works with the *triple bottom line* – the measurement of profit along with ecological and social performance.
- Primary goals are to improve energy efficiency, promote recyclability and reduce use of materials that are hazardous to the environment.
  E.g. ENERGY STAR program: International government-industry partnership that is intended to produce equipment that meets high-energy efficiency specifications or promotes the use of such equipment.
- *E-cycling* the recycling of electronics or computing devices.

Chapter 12- managing information security and privacy

1) What is *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*.

2) What is PIPEDA?

Every time we buy or ask for something we make a transaction.

The *Personal Information Protection and Electronic Documents Act (PIPEDA)* is intended to balance an individual's right to the privacy of his/her personal information, which an organization collects, uses and shares for business purposes.

Governs how data are collected and used.

PIPEDA is overseen by the Privacy Commissioner of Canada.

1. An individual has the right to be informed about which information the organization collects about him/her.
2. Organizations should not be able to use the info collected for any purpose other than what the organization agreed to use it for.
3. An organization's duty is to secure the information it collects.
4. Terms and policies must be clearly defined before a consumer uses a service.

3) What type of security threats does an organization face?

Sources of security problems

1. *Human errors and mistakes* – caused by employees or others outside the business, ex: misunderstanding, poorly designed procedures, etc.
2. *Malicious human activity* – employees or other who intentionally destroys data or system components, ex: hackers, virus & worm writers, criminals, terrorists.
3. *Natural events and disasters* – ex: fire, flood etc.

Types of security problems

1. Unauthorized data disclosure – Procedural mistakes, human error
   Pretexting – someone pretending to be someone else
   Phishing – using a trusted institution name so we'll open it
   Spoofing – fake email sender mail
   Sniffing – intercepting computer communications
   Disclosure during recovery

2. Incorrect data modification – procedural mistakes, incorrect procedures, ineffective accounting controls, system errors
   Hacking – someone breaks into computer/network
   Computer crime
   Incorrect recovery
3. Faulty service – procedural mistakes, development and installation errors
   Computer crime
   Usurpation
   Service improperly restored

4. Denial of service – Accidents
   DOS Attacks
   Service interruptions

5. Loss of infrastructure – Accidents
   Theft, terrorists
   Property loss

Elements of security programs:

1. Senior management involvement
   Must establish security policy, manage risk, balance costs & benefits
   ex: firewalls, encryption
2. Safeguards
   Protections against security threats
   ex: passwords, backup
3. Incident response
   Plan
   ex: administration, training, hiring

4) How can technical safeguards protect against security threats?

Technical safeguards are hardware and software of an information system.

1. Identification and authentication
   Ex: sign in with username and password.
   Smartcards needs a PIN to be open and have a microchip.
   Biometric authentication is like fingerprints, facial features etc.
   Single sign-on for multiple systems: to open one system you need to authenticate many times (at each step).
2. Encryption and firewalls
3. Malware protection – *Malware* is viruses, worms, trojan, horses, spyware (installed on the computer without knowledge) and adware (installed on the computer without the permission.)
   Antivirus programs
4. Application design

5) How can data safeguards protect against security threats?

Data administration - organizations-wide function that establishes data policies and enforces data standards.

Database administration – particular database function that procedures for multi user processing, protects database

1. *Key escrow* is a copy of the *encryption* in case the first key gets lost
2. *Backup copies*
3. Physical security (such as where the computers and DBMS is stored)
4. 3rd party contracts

6) How can human safeguards protect against security threats?

Human safeguards involve people and procedure components.

- **For employees**
  A) User accounts considerations : define job tasks & responsibilities, separate duties & authorities, grant *least* possible privileges, document security sensitivity.
  B) Hiring and screening: references and background checks.
  C) Dissemination: make the employees aware of the security policies and responsibilities by training.
  D) Enforcement: Responsibility (for each position), hold employees accountable, encourage compliance, management attitude.
  E) Employee Termination: accounts and passwords should be removed prior to this.

- **For non-employees**
  Harden the website in order to be protected (take extra measures.)
  Protect users from internal company security problems.

Account administration is a third human safeguard –

A) Account management: the administration of the account and modification of existing accounts.
B) Password management
C) Help desk policies: must know that the user is who he/she says one is.
D) System procedures: have a normal, backup and recovery procedure.

Security monitoring

- Activity log analyses
- Security testing
- Investigation of incidents
- Lesson learned

7) What is disaster preparedness?

- Best safeguard against disasters is appropriate physical location of infrastructure
- Backup processing centers in geographically removed site
- Identify the mission-critical systems & resources needed to run them
- Prepare remote backup facilities

8) How should organizations respond to security incidents?

Organization must have a plan (detail reporting & response)

1. How they should respond
2. Whom to contact
3. Reports to make
4. Steps to insure no future loss

Centralized reporting of incidents
Practise incident responses