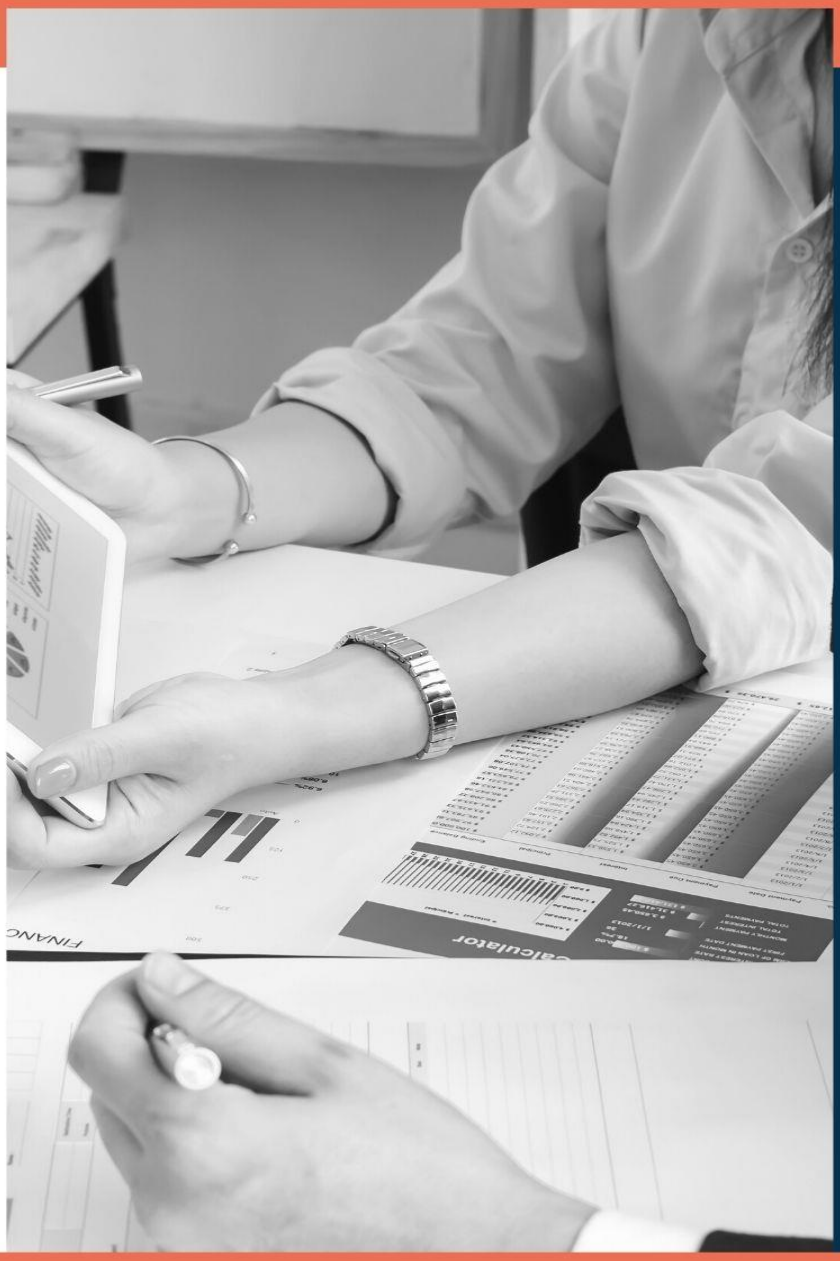
SESSION 2021 / 2022

MANAGEMENT INFORMATION SYSTEM



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MANAGEMENT
INFORMATION SYSTEM

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CHAPTER 1

OVERVIEW OF MANAGEMENT INFORMATION SYSTEM

1.1 OVERVIEW OF INFORMATION SYSTEM

Management Information System is a set of interrelated components that work together that collect, process, share, anddisseminate information to support decision making, coordination, control, analysis, and visualization in an organization. It plays a critical role in increasing productivity and industrial survival

1.1.1 The Difference between Information Technology and Information System

Information Technology (IT)

- Information Technology consists of all the hardware and software that a firm needs to use in order to achieve its business objectives.

Information System (IS)

- Information System can be defined as a set of interrelated components that collect or retrieve, process, store and distribute information to support decision making and control in an organization. In addition to support decision making, coordination and control, information systems may also help managers and workers analyze problems, visualize complex subjects and create new products

1.1.2 The History of Management Information System

The history of information systems (IS) only span five decades. Yet from its inception, IS has done more to expand business and industry into global markets than any other convention in history. By the mid-sixties IS was already forging its way into business mainstream. While computers remained out of reach for most businesses, telecommunications made its mark with the TELEX machine. It was assumed that this area would know the most about using numerical machines.

More and more business computing are moving from PCs and desktop machines to these mobile devices. Managers are increasingly using these devices to coordinate work, communicate with employees, and provide information for decision making. We call these developments the “emerging mobile digital platform.”

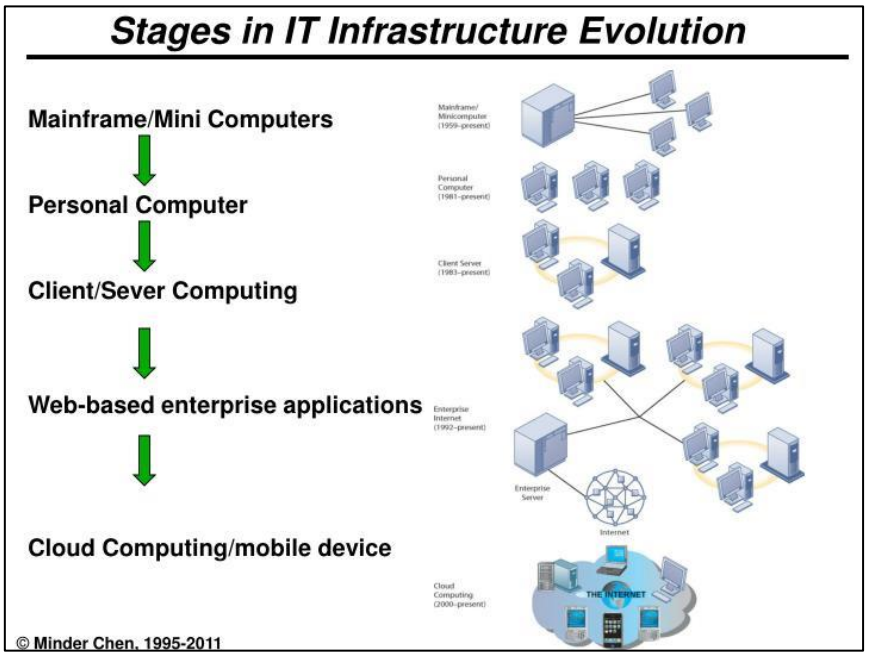


Figure 1.1 Five Phases in Development of Computing Technologies

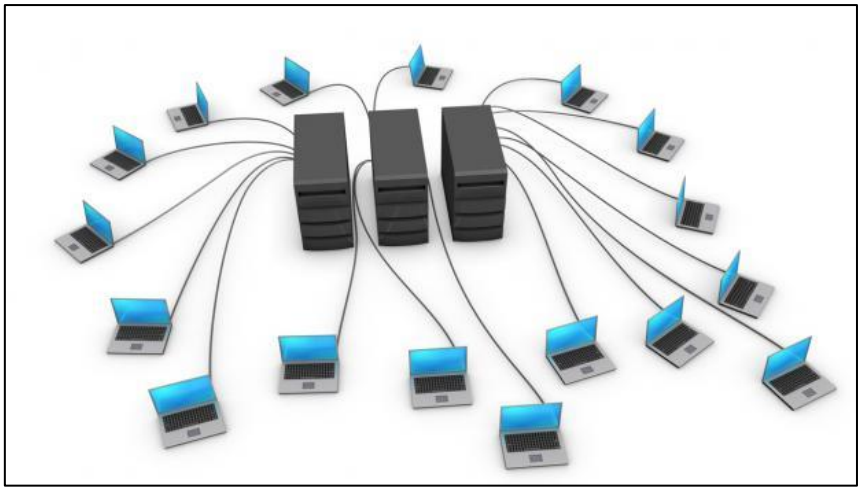


Figure 1.2 Mainframe/Minicomputer

Mainframe

- First commercial computer
- Powerful operating system that could provide time sharing, multitasking and virtual memory in more advanced models.
- Support thousands of online remote terminals connected to the centralized mainframe using communication protocols and data lines.

Minicomputer

- Offered powerful machines at lower process than mainframes
- Making possible decentralized computing, customized to the specific needs of individual departments or business units rather than time sharing on a single huge mainframe.

Figure 1.3 Personal Computer

Personal Computer Era (1981 to Present)

- Using DOS operating system, a text – based command language and later the Microsoft Windows Operating System and Macintosh OS.
- In early 1990s launched personal desktop productivity software tools – word processors, spreadsheets, electronics presentation software and small data management programs – that were very valuable to both home and corporate users.

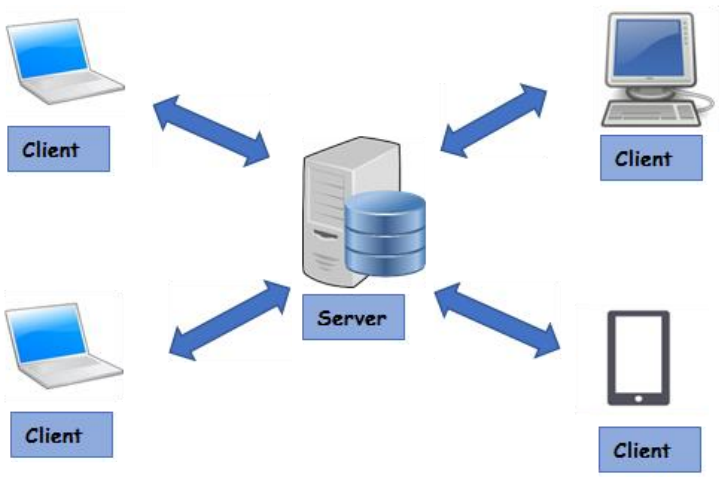


Figure 1.4 Client/Server

Client/Server Era (1983 to Present)

- Desktop or laptop computers are clients to server computers
- Server provides the client computers with a variety of services and capabilities.
- Client/Server computing enables businesses to distribute computing work across a series of smaller, inexpensive machines that cost much less than centralized mainframe systems.
- The client is the user point of entry, whereas the server processes and stores shared data, serves up Web pages or manages network activities.
- Server refers to software application and the physical computer on which the network software runs.

Enterprise Computing Era (1992 to Present)

- Enterprise – wide network enables information flow freely across the organization and between the firm and other organizations.
- It can link different types of computer hardware, including mainframes, servers, Personal Computers and mobile devices and it includes public infrastructures such as the telephone system, the Internet and public network services.

Figure 1.5 Cloud and Mobile Computing

Cloud and Mobile Computing Era (2000 to Present)

- Provides access to a shared pool of computing resources (computers, storage, applications and service) over a network, often the Internet.
- Cloud computing can be accessed from any connected device and location.
- Hundreds of thousand computers are located in cloud data centres, where they can be accessed by desktop computers, laptop computers, tablet, entertainment centres, smart phones and other client machines linked to the Internet
- Software firms such as Google, Microsoft, SAP, Oracle and Salesforce.com sell software applications as services delivered over the Internet

1.2 THE DIMENSION OF INFORMATION SYSTEM

1.2.1 Basic Activities of Information System

- **Input**

✓ Capturing and assembling data that enter the system to be processed.
✓ Activities include data entry, recording or editing.
✓ **Example: Data on a sale transaction may be recorded using online order form. The data would then be entered into a computer system by sales personnel.**

- **Process**

✓ Any data that has been entered into a computer system by activities include calculation, comparison, sorting, classifying and summarizing to produce meaningful output.
✓ This stage of processing converts raw data into a meaningful set of information for the end user

- **Output**

✓ Involves the data that have been produced by a transformation process
✓ The main goal of the output activity is to produce appropriate information for end users, includes messages, reports, forms, graphic images, video, audio responses, paper products or multimedia.
✓ **Example: A Sales Manager may view a video display to check on the performance of a salesperson**

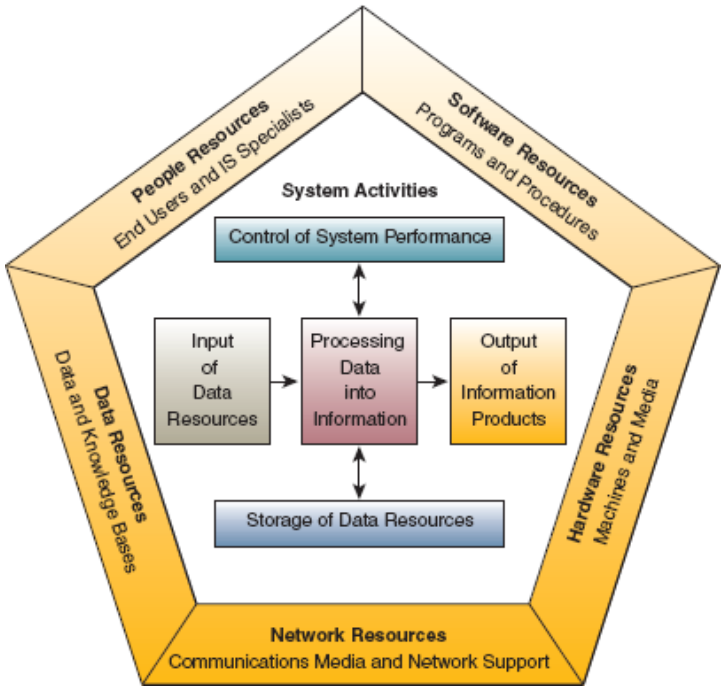


Figure 1.6 Management Information System Model

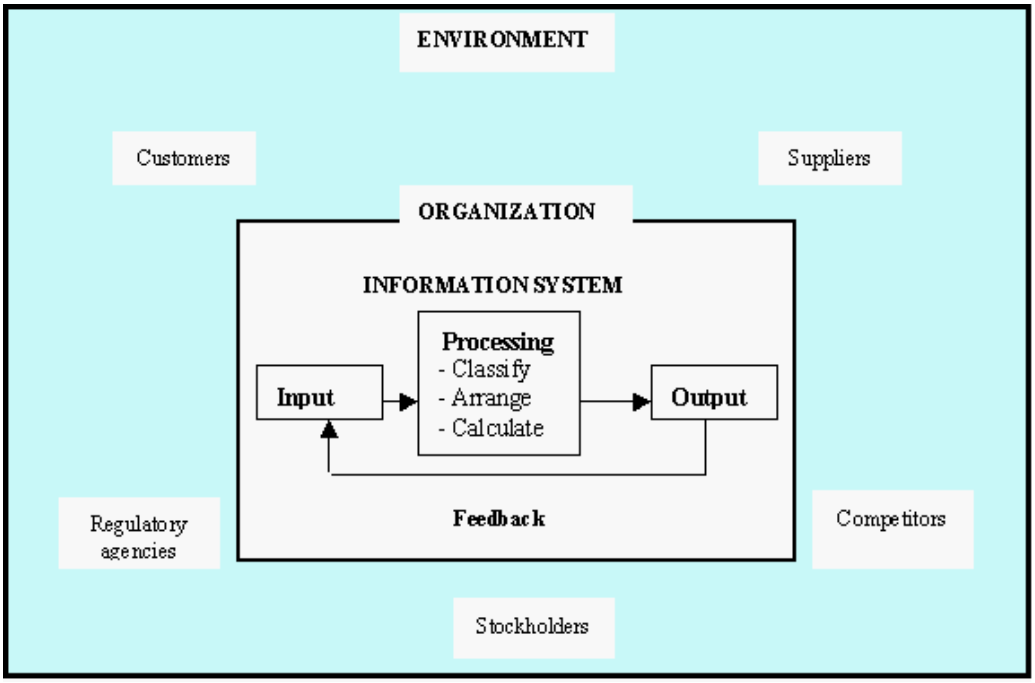


Figure 1.7 Functions of Management Information System

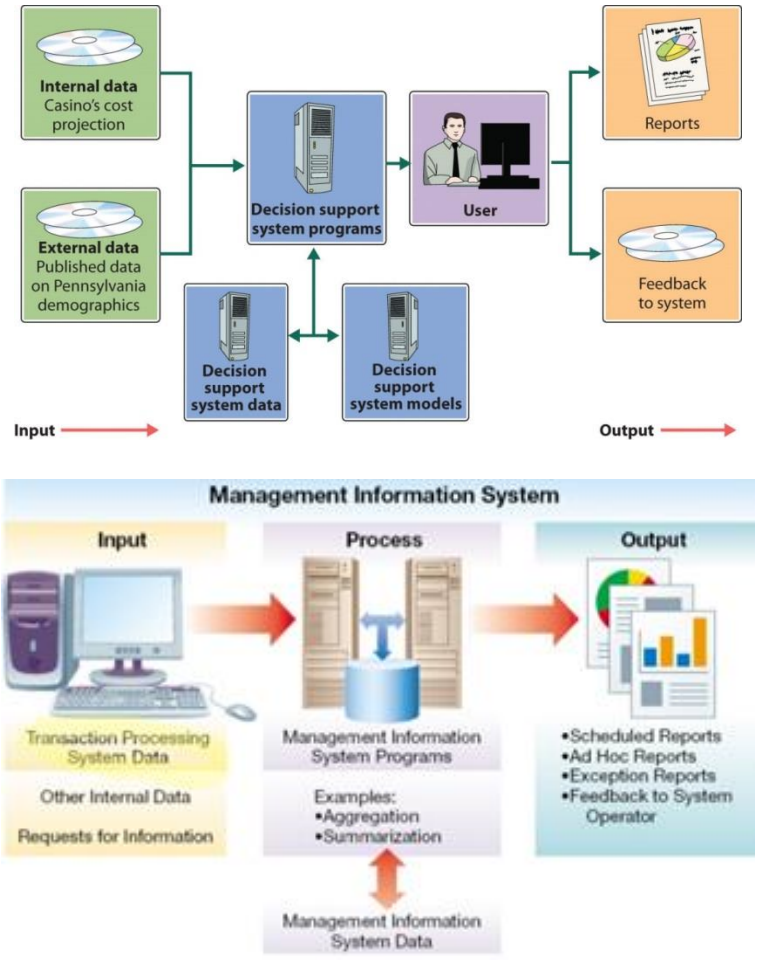


Figure 1.8 Example of Management Information System

1.2.2 The Components of Information System

a. Technology refer to:

- **Hardware**
  - ✓ Tangible component visible to the user.
  - ✓ **Example: Printer, scanner, monitor**, k**eyboard, trackball, video screen, printer**

- **Software**
  - ✓ Set of instructions to the computer hardware to perform a specific task.
  - ✓ Such as programs or application.
  - ✓ It used for processing data and presenting it in meaningful form to aid managerial decision making.
  - ✓ There are System Software, Application Software, Cloud Computing and Open Sources Software

- **Data**
  - ✓ Raw fact representing events occurring in the organization and environment before they have been organized and arranged into a meaningful form.
  - ✓ Data creates value to an organization's resources.
  - ✓ Data can be created, store, retrieved, manipulated, edit, process and analyze in multimedia format such as text, image, video and audio.
  - ✓ In business transaction system, data is collected during the recording of transaction, process and analyzed later for decision-making.

Data Resources	Examples
Alphanumeric Data	Numbers, letters and other characters that describe any transaction
Audio Data	Human voice and other sounds
Image Data	Videos and photographic images, graphic shapes
Text Data	Sentences and paragraph used in written communication

Table 1.1 Examples of Data Resources

- **People** are the most important component in achieving successful operation of Information system, namely Information System Specialists and end users

➢ **Information System Specialists**
  - ✓ Who are a group of people who actually develop and operate information system.
  - ✓ They include Systems Analysts, Software Developers, Programmers, System Operators, Testers, Computer Operators, other Managerial, Technical and Clerical Information System Personnel.

➢ **End Users**
  - ✓ Are people who are known as users or clients
  - ✓ Groups of people who participate in the usage of information system or the outcome it produces.
  - ✓ They can be Accountants, Salespersons, Engineers, Clerks, Customers or Managers.
  - ✓ They are normally found at all levels in an organization.
  - ✓ They are often referred to as knowledge workers which means, people who spend most of their time communicating and collaborating in teams and work groups to create, use and distribute information

- **Process** is a series of steps undertaken to achieve a desired outcome or goal. Process which involves a transformation process that converts input into output. Information Processing refer to:

- **Input**
  - ✓ Capturing and assembling data that enter the system to be processed.
  - ✓ Activities include data entry, recording or editing.
  - ✓ **Example: Data on a sale transaction may be recorded using online order form. The data would then be entered into a computer system by sales personnel.**

- **Processing**
  - ✓ Any data that has been entered into a computer system by activities include calculation, comparison, sorting, classifying and summarizing to produce meaningful output.
  - ✓ This stage of processing converts raw data into a meaningful set of information for the end user

- **Output**
  - ✓ Involves the data that have been produced by a transformation process
  - ✓ The main goal of the output activity is to produce appropriate information for end users, includes messages, reports, forms, graphic images, video, audio responses, paper products or multimedia.
  - ✓ **Example: A Sales Manager may view a video display to check on the performance of a salesperson**

- **Feedback**
  - ✓ Refers to response received on the performance of a system.
  - ✓ **Example: Data received on sales performances is feedback to a Sales Manager**

- **Control**
  - ✓ Monitoring and evaluating feedback received in order to decide whether a system is achieving its goal or not.
  - ✓ **Example: A Sales Manager enforces control when he reassigns salesperson to new sales territories after evaluating feedback on their performance**

- **Storage**
  - ✓ Data is retained in an organized manner for later use in processing and can also be retrieved by end users

1.3 SYSTEM INNOVATION IN BUSINESS TODAY

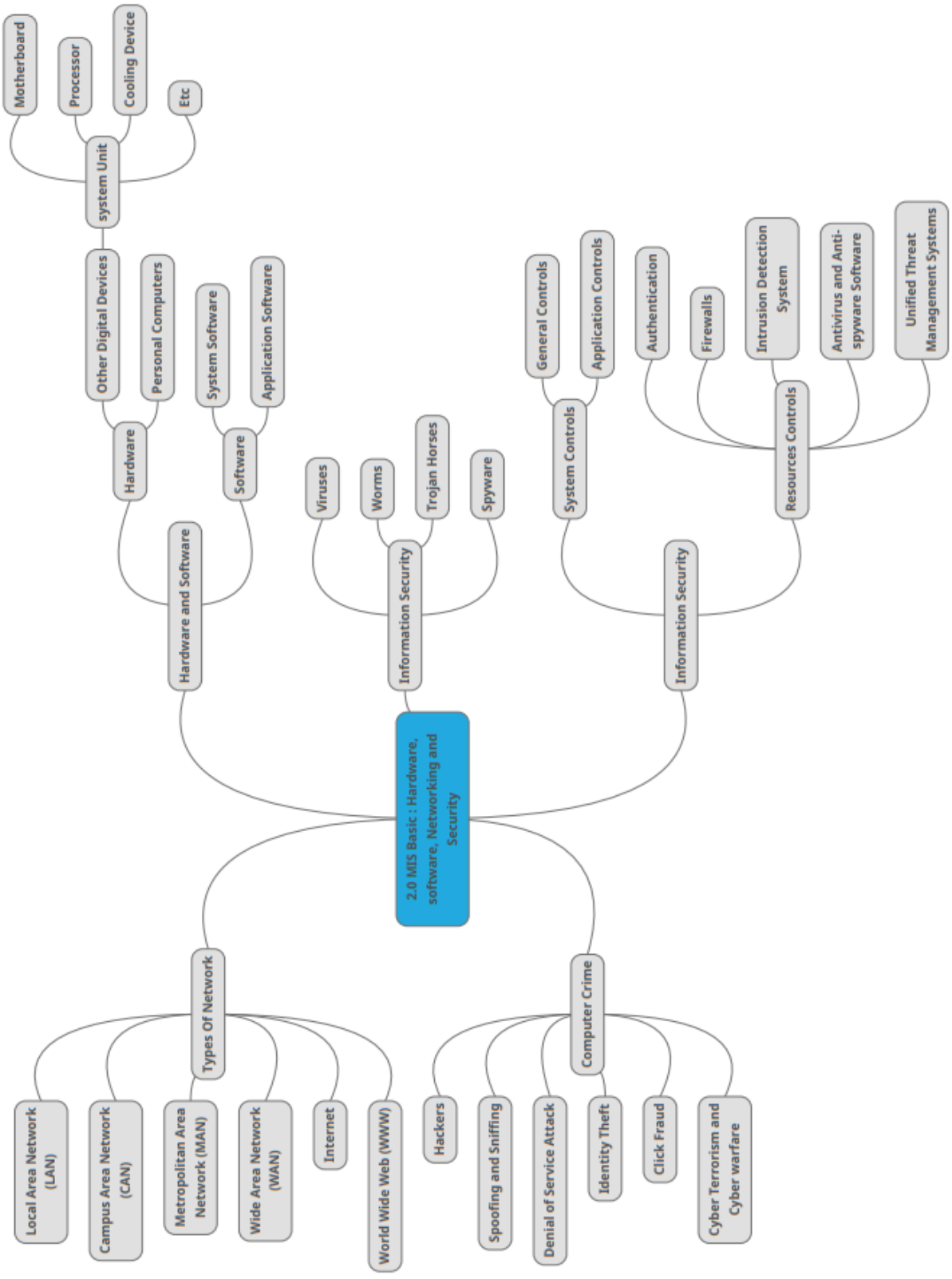
1.3.1 The Role of Information System in Business

- **Business Transformation**
  - Business use smartphone, texting, e – mail and online conferencing, media social, web as tool of business

- **Globalization Opportunities**
  - By using Internet, costs of operating reduced and transaction made over a global.
  - **Example: Google and eBay offer its services worldwide without different layout**

- **Digital Firm**
  - ✓ Time shifting = business being conducted continuously 24 hours a day
  - ✓ Space shifting = work and business conducted virtual and takes place in a global

CHAPTER SUMMARY



Chapter Revision

Section A:
True/False Questions

Q	Description	TRUE	FALSE
1	IT consists of hardware and software		
2	IS can be defined as a set of interrelated components		
3	IS can be used to support decision making		
4	The history of MIS started with personal computers		
5	Personal computers can be transformed into servers		
6	Cloud computing can be seen as early as 1998		
7	Information Technology started since 1960s		
8	Enterprise computing era begin starts 1992		
9	Business transformation is one of the role of information system in business		
10	Globalization is to bring business out from original country to the rest of the world		

Section B:
Structure Questions

1. _____ is a first commercial computers.
2. _____ offered powerful machines at lower process.
3. Microsoft windows operating systems and Macintosh operating systems is an example command language for _____.
4. Desktop or laptop computers are _____ to _____.
5. Examples of software are:
   a) _____
   b) _____
   c) _____
6. Information system specialist is who develop and operate information system. They are known as:
   a) _____
   b) _____
   c) _____
7. Businesses had transforms with the use of technology such as:
   a) _____
   b) _____
   c) _____
8. Example of globalization opportunity are:
   a) _____
   b) _____
   c) _____

9. Gives the definition of Management Information System.

_____

_____

10. Explain the usage of cloud computing.

_____

_____

_____

_____

11. Gives **THREE (3)** differences between data and information.

_____

_____

_____

_____

SECTION C:
Multiple Choice Questions

1. Information technology consists of _____.
   A. All the hardware and software that a firm needs to use in order to achieve its business objectives
   B. All the software and application that a firm needs to use in order to achieve its business objectives
   C. All the hardware and software that a firm needs to use in order to achieve its business globalizations
   D. All the software and application that a firm needs to use in order to achieve its business globalizations

2. Information system can be defined as A set of interrelated components that _____ process, store and distribute information to support decision making and control in an organization.
   A. Collect or disburse
   B. Acquire or retrieve
   C. Collect or retrieve
   D. destroy or match

3. Which of the following is **NOT** stage in IT infrastructure evolution?
   A. Mainframe/Mini computers
   B. Cloud Computing / mobile device
   C. Web based Enterprise application
   D. Internet protocol (IP)

4. The **INCORRECT** example of data resources is _____.
   A. Alphanumeric Data
   B. Audio Data
   C. Text Data
   D. Visually impaired data

5. The above picture is best to describe which stage of IT infrastructure Evolution?
   A. Minicomputer
   B. Personal computer
   C. Desktop
   D. Office computer

6. _____ provide access to a shared pool of computing resources (computers, storage, applications and service) over a network, often the internet.
   A. Cloud and Mobile computing
   B. Cloud and Phone computing
   C. Cloud and remote computing
   D. Cloud and smartphones computing

7. Which of the following is NOT the example of hardware?
   A. Printer
   B. Keyboard
   C. PDF scanner
   D. CPU (Central Processing Unit)

8. Identify the INCORRECT role of information system in business
   A. Technological gap
   B. Business Transformation
   C. Globalization Opportunities
   D. Digital Firms

9. It enables businesses to distribute computing work across a series of smaller, inexpensive machines that cost much less than centralized mainframe systems.
   A. Mainframe/minicomputers
   B. Personal computers
   C. Client/server computing
   D. Cloud computing

10. Using DOS Operating system, a text-based command language and later Ms Windows operating System and Macintosh OS. This statement refers to _____.
    A. Mainframe/minicomputers
    B. Personal computers
    C. Client/server computing
    D. Cloud computing

CHAPTER 2

MANAGEMENT INFORMATION SYSTEMS BASIC

2.1 IDENTIFY THE COMPUTER HARDWARE AND SOFTWARE

2.1.1 Computer Hardware

a. Categories of Computer

There are 6 major computer categories:

- **Mobile Computers**
  - Have great mobility
  - It can be carried from one place to another.
  - It also small in size and can be handheld.
  - It can be connected to another device via Bluetooth and to the Internet using a wireless network or network cable.
  - **Examples of Mobile Computers:**

➢ Notebook Computer or laptop computer are thin and lightweight personal computers with a keyboard which are attached to a monitor that operates on batteries or electricity via a cable

Figure 2.1 Notebook Computer

➢ Tablet enable touch screen interactions using fingers or a stylus.
➢ **Example: Apple iPad, Samsung Tab and Microsoft Surface**

Figure 2.2 Tablet

➢ Smart Phones offer many other functions besides making phone calls and sending short messages (SMS) such as managing personal information, photo – taking, data sharing and internet access capabilities

Figure 2.3 Smart Phone

- E – book Readers are designed for viewing and reading electronic and digital publications such as e – books, e – magazines and e – newspapers. Among the common e –readers are the Amazon Kindle, the Barnes and Noble Nook and the Sony Reader

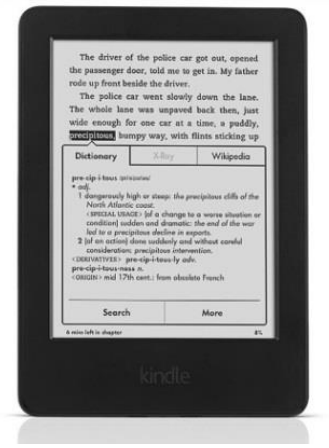


Figure 2.4 E – book Readers

- Handheld Computers are devices designed with industry – specific functions and features to be used by mobile workers like utility readers or documents delivery staff

Figure 2.5 Handheld Computer

- Portable Media Player enables downloading, storing and playing of digital media such as mp3 music, pictures and videos

Figure 2.6 Portable Media Player

- Digital Cameras are devices used to capture, store and play digital images and videos. Pictures and videos can also be downloaded to a computer using a cable or a card reader

Figure 2.7 Digital Camera

- **Microcomputers**
  - Known as Personal Computer (PC) or desktop computer
  - Generally, fit the size of a table and are mainly used by individuals at home and in the office.
  - Consists of a system unit, input, storage and output device.
  - PC caters for use of a single user. If a computer is networked, then the number of users would increase.
  - PC is connected to the Internet through a network cable.
  - PC compatible that use Microsoft Windows as the Operating System and Apple computers have the Macintosh as the Operating System

Figure 2.8 Microcomputer

- **Server**
  - Higher performing capabilities than PC and mobile computers.
  - They serve as an access controller and connector for resources such as input devices, output devices, storage devices, data and information within a network.
  - Servers are also used to store centralized data and files within the organization.
  - This information can also be accessed by internal users through the organization's intranet.
  - Most companies' websites content and files are stored in a server that is connected to the Internet and meant for external users.
  - A server is slightly bigger in size than a PC.
  - Due to the large amounts of data, it is usually installed in a locked room for security purposes.

Figure 2.9 Server

- **Mainframe**
  - Mainframe is larger and more expensive computer than a server.
  - It is used to process large amounts of transactions in an organization.
  - Due to its large physical size, a partial room is required to fit a mainframe computer.
  - **Example: Managing customers' transactions and managing large amounts of internal data and information on inventory, production, sales and market research. It is usually owned by large business corporations such as banks, insurance agencies, market research companies and universities.**

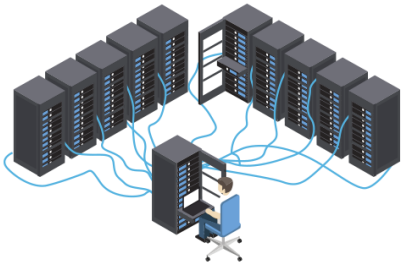


Figure 2.10 Mainframe

- **Supercomputers**
  - Super computers are the largest, fastest, most powerful and expensive computer.
  - It is mainly used to perform complex and sophisticated calculations and simulations by nuclear – energy research agencies, weather forecast agencies, aerospace – related industries and medical industries.
  - It covers a large space, more like an entire floor.
  - It can be connected to more than a thousand users at a time.

Figure 2.11 Supercomputer

- **Embedded Computers**
  - Devices built with computer chips and software embedded within.
  - They are found in consumer electronics, home automation devices, automobiles, process controllers, robotics, computer devices and office machines
  - **Example: Anti – Lock braking system, satellite radio, built – in navigation system, speed and direction sensors and airbag control system, smart homes and driverless cars**

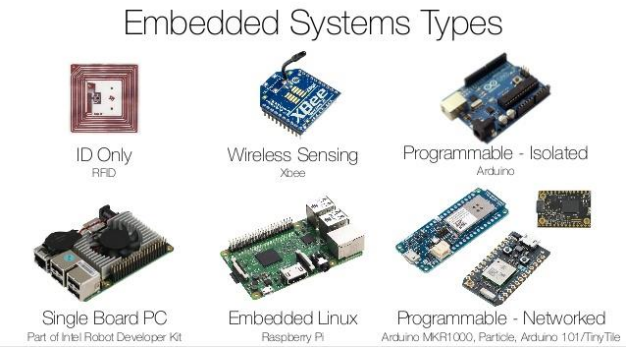


Figure 2.12 Embedded System Types

b. Other Digital Devices

- **The System Unit**
  - It is a set of electronic components that process data and run computer instructions.
  - It includes motherboard, processor, cooling device, memory, slots, cards, ports, buses and power supply

➢ **Motherboard**

- It is a single integrated circuit board, which are connected to all electronic components of a computer.
- It consists of millions of transistors which are used an electronic switch for electrical charges within the motherboard.
- The motherboard will hold and connect the processors, memory, cards and cooling devices using buses and transistors.

Figure 2.13 Motherboard

➢ **Processor**

- Is a computer instructions and operations that are carried out by a central processing unit.
- The speed of the processing depends on the number of processors and its processing capacity in the computer.
- This computer processor chip, which consists of 2 or more processors, is known as a multi – core processor.
- Currently, it is common to find computer chips with dual – core processors (a chip with 2 processor core) and quad – core processors (a chip with 4 processor cores).
- The latest computer are now equipped with 6 core or 8 core processors.

➢ **Memory**

- Memory consists of 2 major types:
  a) RAM – Random Access Memory:
     - Memory which loses its contents when the computer's power is switched off
     - The number of the instructions that can be stored in the RAM depends on it size.
     - The computer would respond faster if the RAM size is larger.
     - Most computers now come with 2GB (gigabytes) of memory size.

b) ROM – Read only memory, flash memory and CMOS:
   - Memory which retain its contents even after the power is switched off
   - Also known as firmware, stores permanent data, instructions or information that cannot be erased even after the power is switched off.
   - This information is produced during the manufacturing of the device.
   - The data cannot be modified or changed, hence the name, read – only memory.

Figure 2.14 Type of Memory

- **Input Technologies**
  - Data or instructions entered into a computer memory are known as input.
  - It comes in the form of a program (series of related instructions), command (instructions to perform a specific task) or user response (replies to the questions posed by the program).
  - Entering such inputs would require an input device.
  - **Example: Keyboard, pointing device, touch screen, pen input, game controller, digital camera, voice input, video input, scanner and readers, microphone, optical readers, biometric input**

➢ **Keyboard**
  - It is the most popular input device used, especially for personal computers.
  - It consists of keys used to type data into a computer.
  - A standard keyboard would consist of 101 to 105 keys comprising the letters A to Z and numbers 0 to 9, navigation keys (arrows, home, page – up, page – down and etc), functional keys (control, alternate, delete, shift, enter and F1 – F12) and applications keys.
  - Keyboards are connected to the central processing unit (CPU) through a cable to a USB port or wireless technology such as Bluetooth or infra – red light.

Figure 2.15 Keyboard

- **Pointing devices** such as computer mouse, trackball, touchpad and pointing stick used to control the movements and actions of the pointer on the screen, to select text, image or objects and to click on images and links.

Figure 2.16 Pointing Devices

- **Digital camera**
  - Allows users to take digital pictures and video clips.
  - These pictures can be downloaded from the memory card into a hard disk before posted in online photo albums

- **Microphone**
  - A microphone is used to record voice and sound

Figure 2.17 Microphone

- **Scanners**
  - Scanners are used to capture printed material such as text and images and convert into digital forms

Figure 2.18 Scanner

➢ **Optical readers**

- Optical readers such as optical character recognition, optical mask recognition, bar code readers and magnetic ink character recognition, which uses light to read characters, marks and codes

Figure 2.19 Optical Readers

➢ **Biometric input** which uses physical and behavioural characteristics of users as input data, such as finger prints, iris patterns, facial features, digital signatures and keystrokes monitoring

Figure 2.20 Finger Print

- **Output Technologies**
  - Output is any data, information or result processed by the system unit.
  - The result of this process is information, which is also known as output and can be used to convey message or for decision making.
  - These outputs will be displayed, conveyed and transmitted to users through output devices **such as monitors, printers, speakers, data projectors, headphone or ear bud**
  - Types of output include:
    a) Printed text: Letters, Newspaper, Memos, Documents, Reports and Books
    b) Images: Photos, Clipart, Animated Graphics, Graphs and Charts
    c) Audio: Conversations, Songs, Music and Pod Casts
    d) Video: Video Clips and Streaming

➢ **Display devices**

- Monitors, plasma monitor, liquid crystal display (LCD) screens are the common output devices used with desktop computers and notebooks.
- For presentation purposes, text and images can be projected and displayed on larger screens for the viewing audience, such as students attending lectures, corporate presentation or talks in meeting rooms or auditorium.
- Some offices and classrooms use interactive whiteboards where data and information are displayed on the board from a networked computer.

Figure 2.21 Display Devices

- **Printers** help transform softcopies from the display device into physical mediums like papers or cards.

Figure 2.22 Types of Printers

- **Audio output** such as speakers, headphones or ear bud can be connected to the computer through cable, but some computers have built – in speakers installed in its display devices or keyboard

Figure 2.23 Audio Output Devices

- **Computer Storage Media**
  - Computer Storage is a secondary storage
  - Storage media hold the data, instructions and information in the computer.
  - Primary storage media is the memory, which is component of the system unit.
  - Memory has the fastest transfer rate among all storage media.
  - Storage medium is measured by capacity and calculated in bytes which are kilobytes (KB) to megabytes (MB) and gigabytes (GB) and terabytes (TB).
  - **Example: Hard Disk, Cloud storage, Express card, External Hard Disk, Internal Hard Disk, Magnetic Strip, Memory Cards, Micro Film, Miniature Hard Disk, Network Storage Device, Optical Disk, Smart Card, Solid State Drive**

Figure 2.24 Computer Storage Media

2.1.2 Computer Software

Software can be classified into 2 types:

1. **System Software or Operating System**
   - Manage the activities of a computer system and provide utilities to manage creation, deletion and storage file.
   - Control and provide support to the operation of computer system, control input output devices and communication links.
   - **Example: Desktops or personal computers use Microsoft Windows 10 while mobile operating systems include android and iOS**
   - Android is an open source operating system for mobile devices such as smart phones and tablet computers while Apple's mobile operating system use **iOS** for the iPhone, iPad and iPod
   - System software is software which interacts primarily with the hardware.
   - When the computer is switched on and until it is shut down, users are interacting with the systems software.
   - It enables the computer to run properly and smoothly
   - Controls the function of a computer.

Figure 2.25 Categories of Operating System

2. Application Software

- It is a program that processing information and produces a particular output.
- It caters to business requirement and transaction processing.
- It also a type of program that receives and process input or raw data from end user and transform them into a report, set of information or complete document.
- To support many tasks related to personal use
- To help organizations to produce many activities
- This program is designed to help users in their daily activities to produce common tasks such as:
  - Browsing the Internet using Internet Explorer
  - Writing letters using word processing software such as Microsoft Word or Corel WordPerfect Office X8
  - Organizing data using database software like Microsoft Access and Oracle
  - Creating and designing brochures and cards using Microsoft Publisher
- Application software also can be used to do specific tasks and can only be used by specialized users. These tasks include:
  - Writing programming language to develop a system by programmers using Microsoft Visual Basic
  - Performing statistical analysis using SPSS
  - Creating Multimedia projects using Adobe Flash
  - Solving and implementing mathematical equations using MATLAB
  - Creating and drawing design using AutoCAD and Adobe Illustrator
  - Creating websites by web programmers using Adobe Dreamweaver or Microsoft Front Page
  - Editing audio/video using Adobe Premier
  - Creating Gantt charts using Project Management Software such as Microsoft Project

Figure 2.26 Types of Application Software

2.2 COMMUNICATIONS NETWORKS AND TYPES OF NETWORK

2.2.1 Types of Network

Computer networks are usually identified by their size and purpose. The size of a network can be distinguished based on geographical area it occupies and the number of computers on the network.

a. Local Area Network (LAN)

- Connects computers and devices in a limited geographical area (within a half mile or 500-meter radius).
- It consists of a computer network in a single office building (connect a few computers in a small office, all the computers in one building or all the computers in several buildings in close proximity).
- LAN offers high speed and it can be low cost.
- The smallest LAN can be built using two computers and a larger LAN is capable of supporting up to thousands of computers.
- LAN relies on wired connections for increased speed and better security; however, it can also have wireless connections or Wireless LAN (WLAN).

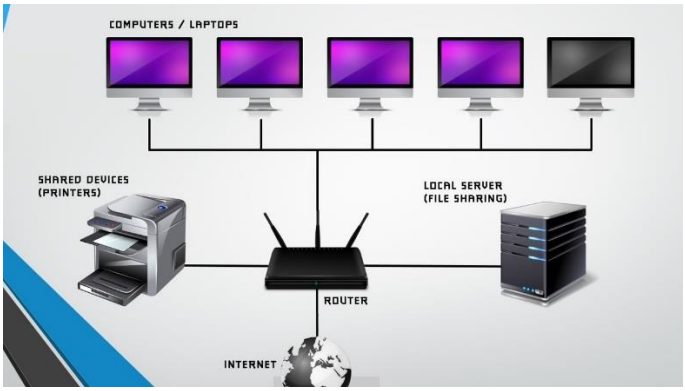


Figure 2.31 Setup for Local Area Network (LAN)

b. Campus Area Network (CAN)

- CAN usually used to form a bigger network, commonly designed for a campus environment.
- It covers up to 1,000 meters (a mile), a college campus or corporate facility

c. Metropolitan Area Network (MAN)

- MAN is larger than LAN.
- It connects LANs across an entire city, campus or region.
- Depending on the configuration, a MAN can cover up to tens of miles.
- MAN is a network that spans a metropolitan area, usually a city and its major suburbs.
- Its geographic scope falls between a WAN and a LAN.

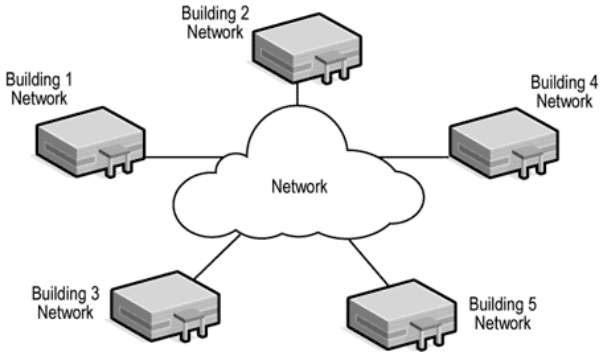


Figure 2.32 Layout for Metropolitan Area Network (MAN)

d. Wide Area Network (WAN)

- WAN is a network that covers a large geographical area such as a country or the entire world.
- It can contain multiple smaller networks like LANs or MANs.
- The Internet is a good example of a wide area network

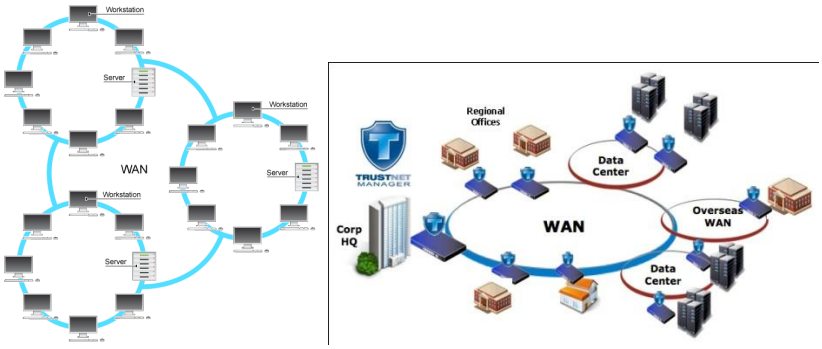


Figure 2.33 Wide Area Network (WAN) Connections

Type	Area
Local Area Network (LAN)	Up to 500 meters (half of mile), an office or Floor of a building
Campus Area Network (CAN)	Up to 1,000 meters (a mile), a college campus or corporate facility
Metropolitan Area Network (MAN)	A City or Metropolitan Area
Wide Area Network (WAN)	A transcontinental or global area

Table 2.1 Types of Networks

e. Internet

- The internet is a world – wide connection of networks involving governments, agencies, business, education bodies and individuals.
- It is huge network that provides information and communication facilities that include many other interconnected networks using standardized communication protocols.

f. World Wide Web

- It is a system with universally accepted standards for storing, retrieving, formatting and displaying information using a client/server.
- Web pages are formatted using hypertext with embedded links that connect documents to one another and that also link pages to other objects such as sound, video or animation files.
- When you click a graphic and a video clip plays, you have clicked a hyperlink

2.3 THREATS TO INFORMATION SECURITY

2.3.1 Malicious Software

a. Viruses

- Computer viruses that occur in the system can damage data, steal information or cripple the system's function.
- The destructive program codes attach themselves to a host in a file or program of a computer system.
- By hosting themselves to a file, they are able to copy themselves and spread to other hosts via e – mail.
- Computer viruses can also be spread when users download files from the internet or when users open a corrupted file.
- Computer viruses are written by individuals with the intention of creating serious damage to private, business and government computers.

- Viruses are a rogue software program that attaches itself to other software program or data files, usually without user knowledge or permission.
- Most computer viruses deliver a payload. The payload may be relatively benign, such as instructions to display a message or image or it may be highly destructive – destroying programs or data, clogging computer memory, reformatting a computer's hard drive or causing programs to run improperly.
- Viruses typically spread from computer to computer when human take an action, such as sending an e-mail attachment or copying an infected file

b. Worms

- Do not have to attach themselves to a computer program
- They are independent programs that replicate or copy themselves by sending copies of files to other computers in the network.
- The network infected by the computer worms is damaged as a lot of bandwidth is used to send millions of messages in the form of span emails.
- Affect the computer memory and cause the system to be unresponsive
- Unlike viruses, worms can operate on their own without attaching to other computer program files and rely less on human behaviour in order to spread from computer to computer.
- Computer worms spread much more rapidly than computer viruses.
- Worms destroy data and programs as well as disrupt the operation of computer networks

c. Trojan Horses

- Independent and legitimate software program.
- The Trojan Horse attaches itself to the computer system and once it is triggered by a pre – set event or date in the computer system, it starts to destroy files or disks
- Trojan horse is a software programs that appears to be benign but then do something other than expected.
- The Trojan horse is not itself a virus because it does not replicate
- **Example: MarketPay is a Trojan Horses for Android phones. This Trojan is hidden in several apps that appear to be legitimate, including travel and weather apps. It places orders for applications and movies automatically without the user's permission, potentially causing users to be hit with unexpectedly high phone bills.**

d. Spyware

- Spyware is an independent software program embedded in computer systems.
- Spyware is used to gather private personal information that is then relayed to third parties that have interests in the information.
- Spyware applications can monitor keystrokes, scan files and snoop on other applications.
- Spyware can also read cookies and change the default homepage on the web browser.
- Spyware is often installed while a person visits a website by clicking on a disguised pop – up window or when downloading a file from the Internet.
- Spyware steals serial numbers for software to launch Internet attacks, to gain access to e – mail accounts, to obtain passwords to protected computer system or to pick up personal information such as credit card numbers.
- **Example: The Zeus Trojan stole financial and personal data from online banking and social networking sites by tracking users' keystrokes as they entered data into their computers.**
- **Example: Other Spyware programs reset Web Browser home pages, redirect search requests or slow performance by taking up too much memory**

2.3.1 Computer Crime

a. Hackers and Crackers

- Hackers are an individual who intends to gain unauthorized access to a computer system for which they do not have legitimate access and committing a criminal offence.
- Hacker refers to someone who enjoys going into a system and using it extensively in order to understand how the entire system works, so that they become an expert in that particular system.
- Crackers are people who try to break into the systems through common methods such as cracking passwords, exploiting known security weaknesses and spoofing of a network.
- Hacking and cracking are malicious acts by people inside or outside the organization.
- They are trying to harm and disrupt an organization.
- Malicious attacks from people within organizations are the most dangerous, especially those who are former employees.
- Malicious attacks can also come from outside the organizations who try to access and browse through computer systems to reveal confidential information to the public.
- Hackers' activities include theft of goods and information, system damage and Cyber vandalism, the intentional disruption, defacement or destruction of a Web site or Corporate Information System.
- **Example: Cybervandals have turned many of the MySpace "group" sites, which are dedicated to interests such as animal welfare into cyber – graffiti walls, filled with offensive comments and photographs**
- The motive of Hackers and Crackers for going into an organization's computer system is normally to disrupt services and the continuity of business operations by using denial – of – service attack tools.
- Many of these Hackers and Crackers may also want to steal information to sell it to competitors

b. Spoofing

- Email messages that appear to have been sent from someone with malicious intention, such as virus writers and individuals who send spam mail.
- They disguise themselves as someone using an email that is not their own.
- They hide their true identities; misrepresent themselves by using fake e – mail addresses or masquerading as someone else.
- It involves redirecting a Web Link to an address different from the intended one with the site masquerading as the intended destination.
- **Example: If hackers redirect customers to a fake Web Site that looks almost exactly like the true site, they can collect and process orders, effectively stealing business as well as sensitive customer information from the true site**

c. Sniffing

- The type of eavesdropping program that monitor information over a network.
- When use legitimately, sniffers help identify potential network trouble spots or criminal activity on networks but when used for criminal purposes, they can be damaging and very difficult to detect.
- Sniffers enable hackers to steal information from anywhere on a network, including e – mail messages, company files and confidential reports

d. Denial of Service (DOS) Attack

- Sometimes organizations receive vast number of fake requests sent through their server by hostile users.
- These requests can cause the server to crash, making it difficult for the organizations to establish a connection between its server and its legitimate clients.
- The difficulty to establish connections between servers and legitimate clients is termed as DOS attack
- Hackers use this condition to their advantage by hijacking and controlling thousands of computers remotely to launch massive and coordinated attacks.

- Massive DOS attacks within the organization can paralyze a network system, resulting in significant server downtime and financial loss
- Hackers flood a network server or Web server with many thousands of false communications or requests for services to crash the network.
- Although DOS attacks do not destroy information or access restricted areas of a company's information systems, they often cause a Web site to shut down, making it impossible for legitimate users to access the site.

e. Identity Theft

- The act of pretending to be someone else by using someone else's identity as one's own or use of a false identity.
- Illegal migration, terrorism and blackmail are often made possible by means of identity theft.
- Crime in which an imposter to obtains the personal information of and may be used to obtain credit

f. Click Fraud

- Occurs when an individual or computer program fraudulently clicks on an online advertisement without any intention of learning about the advertiser or making a purchase.
- Become a serious problem at Google and other Web sites that feature pay-per-click online advertising.
- When you click on an advertising displayed by a search engine, the advertiser typically pays a fee for each click, which is supposed to direct potential buyers to its products.

g. Cyber Terrorism and Cyber Warfare

- State sponsored activity designed to defeat another state by penetrating its computer or networks for the purposes of causing damage and disruption.
- **Example: Stolen plans for missile tracking system, satellite navigation devices, surveillance drones and leading jet fighters**
- It poses a serious threat to the infrastructure of modern societies, since their major financial, health, government and industrial institutions rely on the Internet for daily operations.

2.4 INFORMATION SECURITY

2.4.1 Identify Information Systems Controls

a. General Controls

- Control the design, security and use of computer programs and the security of data files in general throughout the organization's information technology infrastructure.
- Apply to all computerized applications and consist of a combination of hardware, software and manual procedures that create an overall control environment.

Type of General Control	Description
Software Controls	Monitor the use of system software and prevent unauthorized access of software programs, system software and computer programs. System software is an important control area because it performs overall control functions for the programs that directly process data and data files
Hardware Controls	Ensure that computer hardware is physical secure and check for equipment malfunction. Computer equipment should be specially protected against fires and extremes of temperature and humidity. Organizations that are dependent on their computers also must make provisions for backup or continued operation to maintain constant service

Computer Operations Controls	Oversee the work of the computer department to ensure that programmed procedures are consistently and correctly applied to the storage and processing of data. They include controls over the setup of computer processing jobs and computer operations and backup and recovery procedures for processing that ends abnormally
Data Security Controls	Ensure that valuable business data files on either disk or tape are not subject to unauthorized access, change or destruction while they are in use or in storage
Implementation Controls	Audit the systems development process at various points to ensure that the process is properly controlled and managed. The systems development audit looks for the presence of formal reviews by users and management at various stages of development, the level of user involvement at each stage of implementation and the use of a formal cost benefit methodology in establishing system feasibility. The audit should look for the use of controls and quality assurance techniques for program development, conversion and testing and for complete and through system, user and operations documentation
Administrative Controls	Formalize standards, rules, procedures and control disciplines to ensure that the organization's general and application controls are properly executed and enforced

Table 2.2 General Controls

b. Application Controls

- Specific controls unique to each computerized application, such as payroll or order processing.
- They include both automated and manual procedures that ensure that only authorized data are completely and accurately processed by that application.
- Application controls can be classified as:
  - i. Input controls
    - Check data for accuracy and completeness when they enter the system.
    - There are specific input controls for input authorization, data conversion, data editing and error handling.
  - ii. Processing controls
    - establish that data are complete and accurate during updating.
  - iii. Output controls
    - ensure that the results of computer processing are accurate, complete and properly distributed.

2.4.2 Information Resources Controls

i. Authentication

- The ability to know that a person is who claims to be.
- To gain access to a system, a user must be authorized and authenticated.
- It can be Password, Token, Smart card or Biometric Authentication.

ii. Password

- Authentication is often established by using password known only to authorize users.
- User uses a password to log on to a computer system and may also use passwords for accessing specific systems and files.
- Users often forget passwords, share them or choose poor passwords that are easy to guess, which compromises security.
- Passwords can also be "sniffed" if transmitted over a network or stolen through social engineering.

iii.Token

- A token is a physical device, similar to an identification card that is designed to prove the identity of a single user.
- Tokens are small gadgets that typically fit on key rings and display passcodes that change frequently.

iv.Smart Card

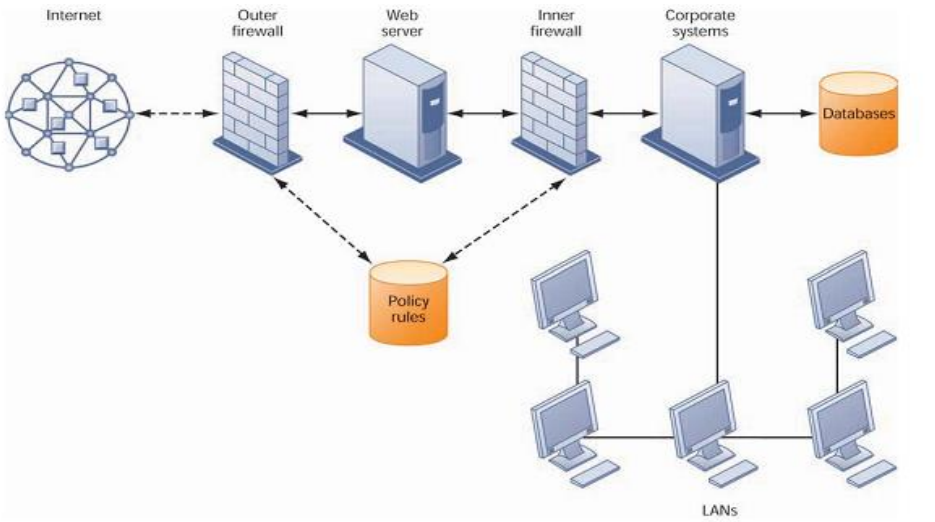
- Smart card is a device about the size of a credit card that contains a chip formatted with access permission and other data.
- Used in electronic payment systems.
- A reader device interprets the data on the smart card and allows access.

v.Biometric Authentication

- Uses systems that read and interpret individual human traits, such as fingerprints, irises, faces, retinal images and voices, in order to access.

vi. Firewalls

- Prevent unauthorized users from accessing private networks.
- Combination of hardware and software that controls the flow of incoming and outgoing network traffic.
- It is generally placed between the organization's private internal networks and distrusted external networks, such as the Internet.
- Used to protect one part of a company's network from the rest of the network.
- Acts like a gatekeeper who examines each user's credentials before access is granted to a network
- Identifies names, IP addresses, applications and other characteristics of incoming traffic.
- It checks this information against the access rules that have been programmed into the system by the network administrator.
- Prevents unauthorized communication into and out of the network.



The firewall is placed between the firm's private network and the public Internet or another distrusted network to protect against unauthorized traffic.

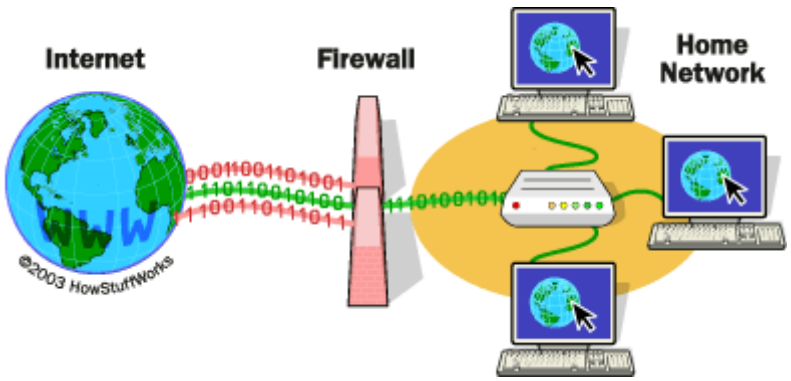


Figure 3.4 Corporate Firewall

vii. Intrusion Detection System (IDS)

- Protect against suspicious network traffic and attempts to access files and databases.
- Full-time monitoring tools placed at the most vulnerable points or “hot spots” of corporate networks to detect intruders
- The system generates an alarm if it finds a suspicious event.
- Scanning software looks for patterns indicative of known methods of computer attacks, such as bad passwords, checks to see if important files have been removed or modified and sends warnings of vandalism or system administration errors.
- Monitoring software examines events as they are happening to discover security attacks in progress.
- IDS can also be customized to shut down a particularly sensitive part of a network if it receives unauthorized traffic.

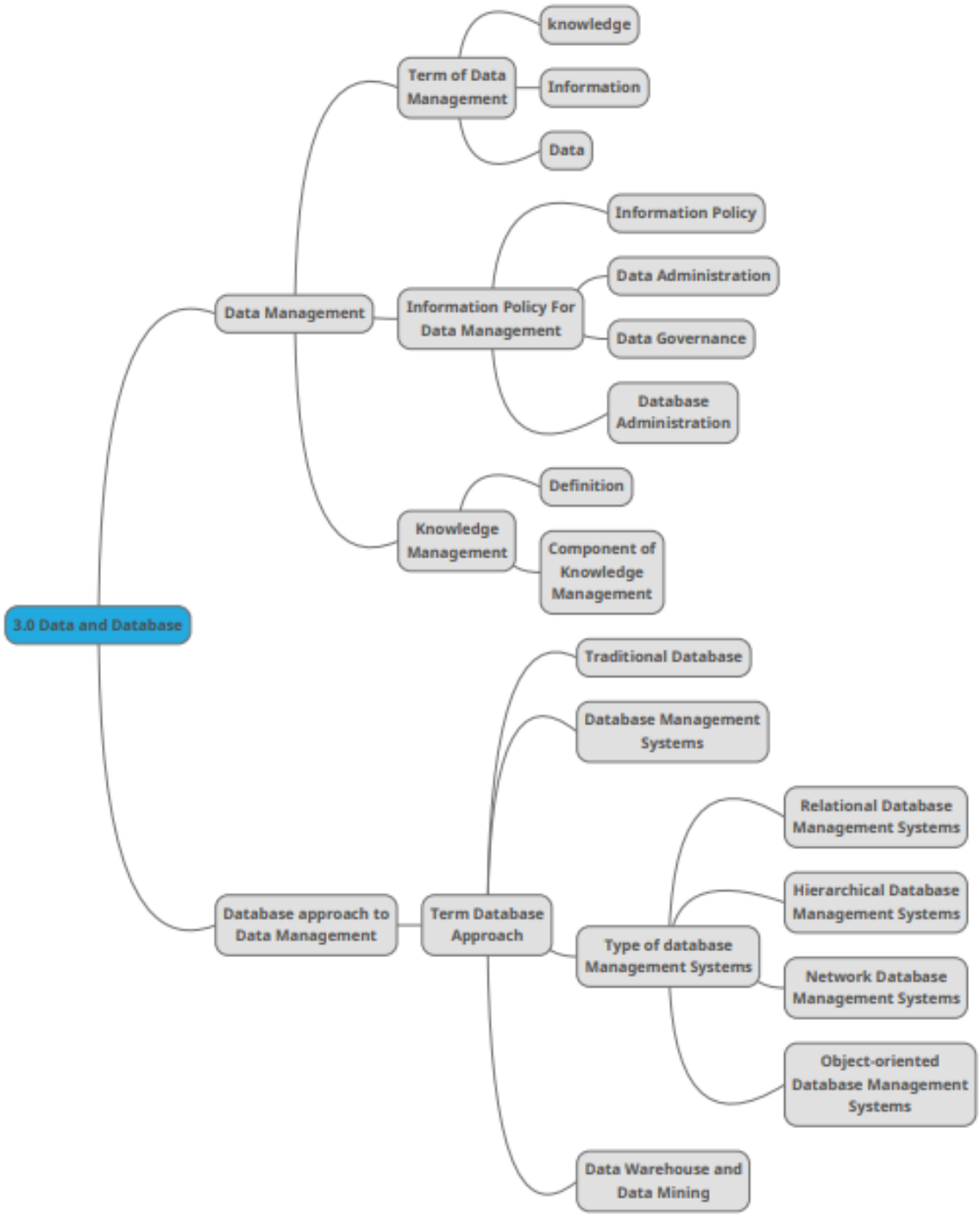
viii. Antivirus and Antispyware Software

- Antivirus software prevents, detects and removes malware, including computer viruses, computer worms, Trojan horses, spyware and adware.
- Most antivirus software is effective only against malware already known when the software was written.
- To remain effective, the antivirus software must be continually updated.

ix. Unified Threat Management System (UTMS)

- A combination into a single appliance various security tools, including firewalls, virtual private networks, intrusion detection systems, Web content filtering and antispam software.
- Help businesses reduce costs and improve manageability.
- Available for all sizes of networks, initially aimed at small and medium-sized businesses.
- **Example: Crossbeam, Fortinet and Check Point.**

CHAPTER SUMMARY



Chapter Revision

SECTION A:
Multiple Choice Questions

1. _____ refers to controlling process of the computer hardware operations. It is one of the most critical functions of systems. It also supports the application programs' problem-solving capabilities and makes the computer system working and useful.
   A. Hardware
   B. Software
   C. Network
   D. Computer System

2. Browser enables the user to navigate the world wide web. The two leading browsers are Mozilla Firefox and Microsoft Internet Explorer.
   A. Application
   B. Utility
   C. Operating
   D. Digital

3. Which of the following is **NOT** an input device?
   A. Barcode Reader
   B. Touch Screen
   C. Magnetic card reader
   D. Printer

4. The items below are the hardware **EXCEPT**
   i. Monitor
   ii. Printer
   iii. Microsoft Words
   iv. Trojan Virus

   A. I and II
   B. II and III
   C. III and IV
   D. III only

5. _____ refers to computer programme that can read instructions.
   A. Software Perisian
   B. Data
   C. Systems
   D. Computer

6. _____ is a computing base that provide shard computer over a network especially internet.
   A. Personal computer
   B. Cloud Computing
   C. Open Source Computing
   D. Communication Computing

7. _____ is an unwanted software program that attaches itself to other software programs or data files in order to be executed, usually without the user's knowledge or permission.
   A. Spyware

B. Worm
C. Trojan Horses
D. Viruses

8. Which of the example is an example of computer crime?
   i. Threatening to cause damage to a protector computer
   ii. Accessing a computer system without authority
   iii. Breaching the confidentiality of protected computerized data
   iv. Illegally accessing stored electronic communications, including e-mail, and voice mail

   A. I, II and III
   B. I,II and IV
   C. II, III and IV
   D. I,II,III and IV

9. Which of the following is the best explanation for password as an Authentication method?
   A. Users often forget passwords, share them or choose poor passwords that are easy to guess, which compromises security
   B. Small gadgets that typically fit on key rings and display passcodes that change frequently
   C. Device about the size of a credit card that contains a chip formatted with access permission and other data
   D. Systems that read and interpret individual's human traits, such as fingerprints, irises and voices in order to grant or deny

10. Which of the following statements refers to SPYWARE?
   A. An independent computer software that can copy themselves from one computer to other computers over a network
   B. It is hidden in application/operating system without the user's permission to do transaction
   C. It is designed to collect information without the user's knowledge
   D. It is attached to other software or data without the user's knowledge

SECTION B:
Structure Questions

1. List five examples of common computer hardware among small companies.
   a) _____
   b) _____
   c) _____
   d) _____
   e) _____

Figure 1

2. Based on Figure 1, identify the name of the hardware and its functions.

   _____
   _____
   _____
   _____

3. Describe **THREE (3)** terms of data management.
   a) _____
   b) _____
   c) _____

4. Describe database management systems (DBMS).

   _____
   _____
   _____

5. List **TWO (2)** the enterprises application system.
   a) _____
   b) _____

CHAPTER 3

DATA AND DATABASE

3.1 DATA MANAGEMENT

3.1.1 Term of Data Management

a. Data

- Data is a stream of raw fact representing event occurring in organizational
- It is raw, unprocessed information, unorganized forms (such as text, images, audio, video, alphabets, numbers, fact, figures, object, thing or symbols) that refer to or represent conditions, ideas or objects.
- Data is always collected with an objective in mind.
- Data should be of high quality, it is important to ensure that they can be easily accessed.

b. Information

- Information is a valuable resource for successful running of the business.
- It also a data that have been processed, interpreted, organized or structured to provide context and presented in different format to assist decision makers.
- It has been shaped into a form that is meaningful, useful and has specific meanings to human beings and it is normally accurate information that is free of error.
- **Example: If a manager is told his/her company's net profit decreased in the past month, he/she may use this information as a reason to cut financial spending for the next month**
- Information is relevant when it is useful and appropriate for the decisions that require it.
- Information is timely when it is available to decision makers when it is needed.

c. Knowledge

- Knowledge is a familiarity, awareness or understanding of something, such as facts, information, descriptions or skills through experience or education by perceiving, discovering or learning.
- Knowledge is a cognitive, even a physiological, event that takes place inside people's heads.
- It is also stored in libraries and records, shared in lectures, and stored by firms in the form of business processes and employee know-how.
- Knowledge can refer to a theoretical or practical understanding of a subject.
- **Example, you must know when to perform a procedure as well as how to perform it.**

3.1.2 Explain an Information Policy for Data Management

a. Information Policy

- Specifies the organization's rules for sharing, disseminating, acquiring, standardizing, classifying and inventorying information.
- Lays out specific procedures and accountabilities
- Identifying which users and organizational units can share information, where information can be distributed and who is responsible for updating and maintaining the information.
- **Example: A typical information policy would specify that only selected members of the payroll and human resources department would have the right to change and view sensitive employee data, such as an employee's salary or social security number and that these departments are responsible for making sure that such employee data are accurate.**

b. Data Administration

- Responsible for the specific policies and procedures through which data can be managed as an organizational resource.
- These responsibilities include developing information policy, planning for data, overseeing logical database design and data dictionary development and monitoring how information systems specialists and end-user groups use data.

c. Data Governance

- Deals with the policies and processes for managing the availability, usability, integrity and security of the data employed in an enterprise, with special emphasis on promoting privacy, security, data quality and compliance with government regulations.

d. Database Administration

- A large organization will also have a database design and management group within the corporate information systems division that is responsible for defining and organizing the structure and content of the database and maintaining the database.
- In close cooperation with users, the design group establishes the physical database, the logical relations among elements and the access rules and security procedures.

3.1.3 Knowledge Management

Knowledge Management (KMS) is a set of business processes developed in an organization to create, store, transfer and apply knowledge. It can increase the ability of the organization to learn from its environment and to incorporate knowledge into its business processes. KMS lets an organization gather, organize and share business knowledge within an organization. KMS contains a central repository of information that is well structured and employs a variety of search tools which are effective and easy-to-use to help users find answers to questions fast.

- **Example: The Doctor discovers a new method of treating a certain illness and shares this knowledge in the repository. This can lead to better treatment methods or perhaps even better drugs. Users are going to frequently access the knowledge repository and this will result in the development of best practices, policies and business solutions based on this knowledge. So it becomes a new culture and evolves as a result of innovation. This knowledge of course can be used to facilitate decision making, which points to the first imperative**

a. Components of Knowledge Management

Figure 3.1 Components of Knowledge Management

3.2 DATABASE APPROACH TO DATA MANAGEMENT

3.2.1 The Term of Database Approach to Data Management

a. Traditional Database

- Typically, all information is gathered using the manual system.
- This system uses paper, kept in files and locked in cabinets for security purposes.
- There are limitations in traditional file processing. They include:

✓ **Separation of Data**
- Data those are separated in many files are difficult to access.
- When more than one type of data located in different files are needed, it must be synchronized in order to get accurate results

✓ **Data Redundancy**
- Duplicate data in multiple data files
- Same data are stored in more than one place or location.
- Data redundancy occurs when different groups in an organization independently collect the same data and stores it independently of each other.
- Data redundancy wastes storage resources and it may cause to be inaccurate

✓ **Program Data Dependence**
- Data that are located in various files are dependent on each other.
- Any changes to data in one file should also be updated and saved in the other files

✓ **Lack of Flexibility**
- A traditional file system cannot deliver ad hoc reports or respond immediately

✓ **Poor Security**
- Access and dissemination of information may be out of control, because there is little control
- Management do not know who is accessing or making changes to the organization's data

✓ **Incompatible File Formats**
- Each file must be in the same format.
- If files are in different formats, the data may be difficult to access.

✓ **Lack of Data Sharing and Availability**
- Because of information in different files and cannot be related to one another, it is impossible for information to be shared or accessed in a timely manner.
- Information cannot flow freely across different functional areas or different parts of the organization.

✓ **Data Inconsistency**
- Data inconsistency is where the same attributes may have different values.
- **Example: in instances of the entity COURSE illustrated in Figure 3.2, the data may be updated in some systems but not in others. The same attribute, Student-ID, may also have different names in different systems throughout the organization. Some systems might use Student-ID and others might use ID.**

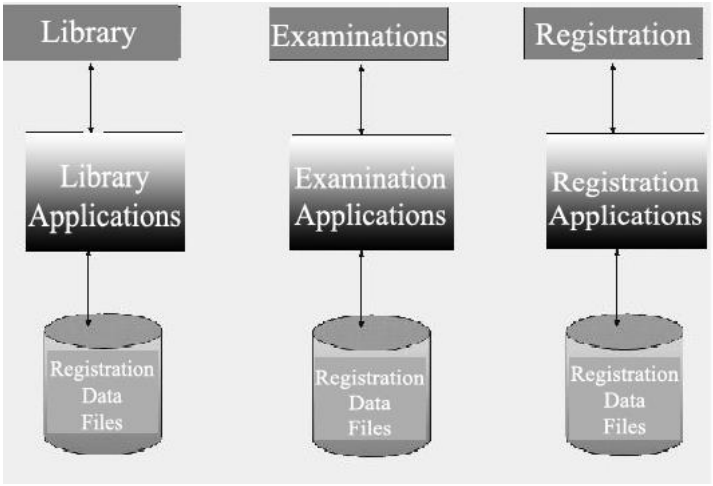


Figure 3.2 Traditional File Processing

Addition confusion might result from using different coding systems to represent values for an attribute. For instance, the sales, inventory and manufacturing systems of a clothing retailer might use different codes to represent clothing size. One system might represent clothing size as 'extra-large' whereas another might use the code 'XL' for the same purpose. The resulting confusion would make it difficult for companies to create customer relationship management, supply chain management or enterprise system that integrate data from different sources.

b. Database Management System (DBMS)

- To overcome the problems of manual filing systems, the DBMS has been developed.
- DBMS are collections of application programs that have specific purposes.
- It is more efficient as everything is computerized, grouped and data are stored electronically using computers.
- DBMS is a software or program that permits an organization to centralize data, manage them efficiently and provide access to the stored data by application programs.
- A DBMS interacts with users and other application software.
- It allows users to create, store and access data by adding, deleting, modifying, analysing and managing
- Tool for maintaining data, managing security and integrity of data and providing data recovery.
- DBMS performs 4 major operations, namely:

✓ Creating and entering data into the database

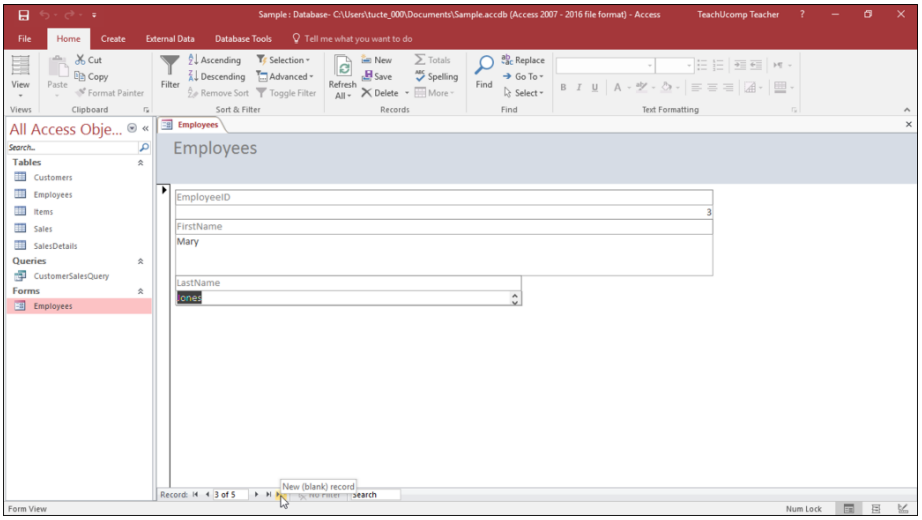


Figure 3.3 Data Entry Form in Access

✓ Accessing data in the database

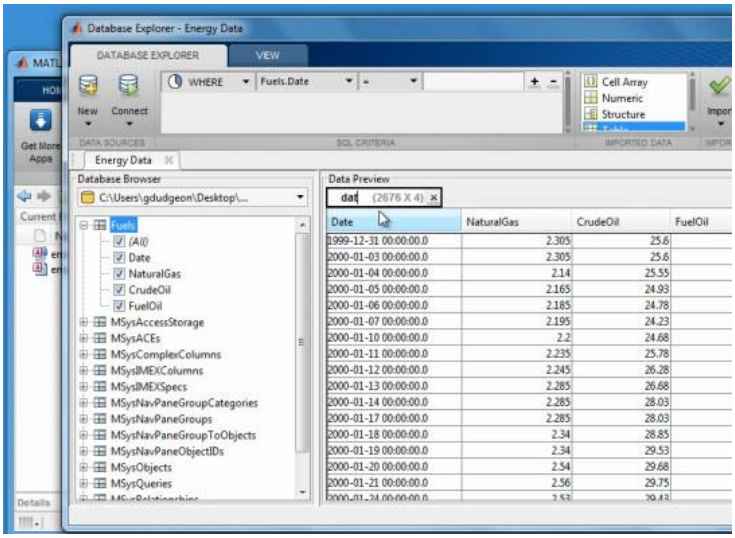


Figure 3.4 Data Acquisition or Accessing Data Directly from Database and Data Server

✓ Querying data from the database

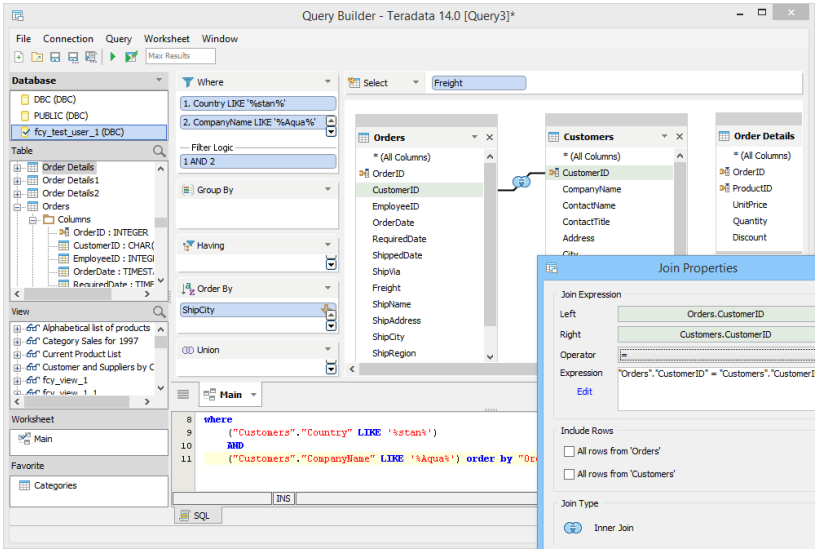


Figure 3.5 Querying Data from the Database

✓ Displaying data from the database

Displaying DB data using Angular in MVC5

Full Name	Email	DOB	Phone	Address	Designation
Chanakya	chani@live.com	05-03-1993	87775878776	US	Game designer
Mark twain	markt@outlook.com	03-11-1992	1029328433	Washington	UI designer
Raviteja	ravi@gmail.com	02-10-1994	9034902348	Hyderbad	Dotnet developer
snr chowdary	snrchowdary@gmail.com	05-03-1995	897236225672	Bangalore	Network admin
Thomas	thomas@yahoo.com	03-03-1995	8762766326	Chennai	Java Developer

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Figure 3.6 Displaying Data from the Database

As illustrate in figure 3.7, when the application programs call for a data item such as gross pay, the DBMS find the item in the database and presents it to the application program. Using the traditional data files, the programmer would have to specify the size and format of each data element used in the program and then tell the computer where they were located.

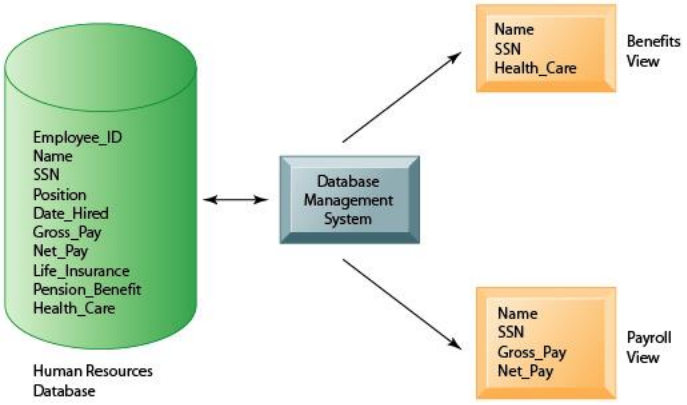


Figure 3.7 Human Resources Database with Multiple Views

- **The Advantages of DBMS:**
  - Reduces data redundancy - Data in the database is integrated with each other, thus multiple copies of files are impossible
  - Increase data consistency - By reducing data redundancy, the possibility of data being inconsistent is lowered, because data is updated automatically in all related files when changes is made in one file
  - Increase data security and integrity - Database provides data security as passwords only authorized users may access the database
  - Allows data access and sharing - Data can be shared by many users and can also be easily accessed, as all the data is integrated
  - Increase productivity - Users may access data in different areas without interference from one another and it may increase productivity of data in the database

- **The Disadvantages of DBMS:**
  - A database system is a complex because it contains many integrated files
  - The size is very large and its storage capacity would be bigger
  - The cost of DBMS is higher because its own special software, extra hardware and others costs related to human labour
  - Slow in performance

3.2.2 Types of Database Management System (DBMS)

a. Relational Database Management System

- Relational database represents data as two-dimensional tables called relation.
- Table may be referred to as file.
- Each table contain data on an entity and its attributes.
- A relational database refers to a database that stores data in a structured format, using rows and columns. This makes it easy to locate and access specific values within the database.
- It is "relational" because the values within each table are related to each other. Tables may also be related to other tables. The relational structure makes it possible to run queries across multiple tables at once.
- It is the software that executes queries on the data, including adding, updating and searching for values.

- It also provides a visual representation of the data. For example, it may display data in a table like a spreadsheet, allowing you to view and even edit individual values in the table. Some programs allow you to create forms that can streamline entering, editing, and deleting data.
- **Example:**
  - ✓ **Microsoft Access is a relational DBMS for desktop system**
  - ✓ **DB2, MySQL, Oracle Database and Microsoft SQL Server are relational DBMS for large mainframes and midrange computers**
  - ✓ **MySQL is a popular open source DBMS**
  - ✓ **Oracle Database Lite is a DBMS for mobile computing device**

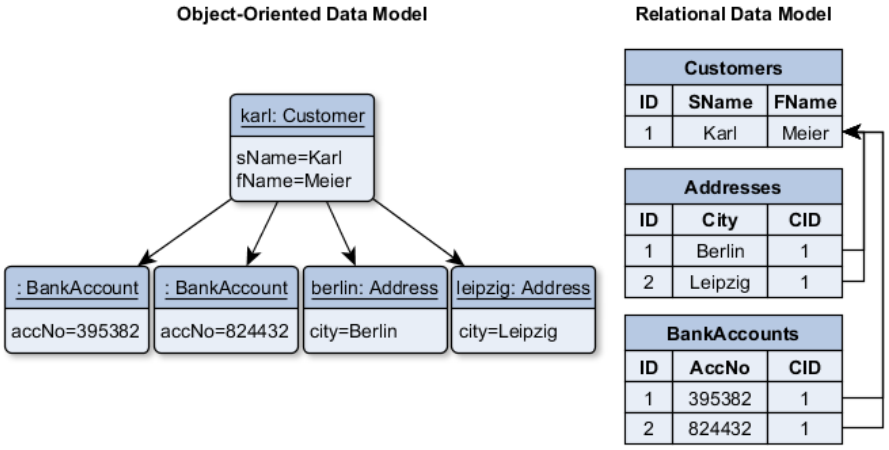


Figure 3.8 Relational Database Organizes Data in the Form of Two-Dimensional Tables

b. Hierarchical Database Management System

- In a hierarchical database management systems model, data is stored in a parent-children relationship node.
- In a hierarchical database, besides actual data, records also contain information about their groups of parent or child relationships.
- In a hierarchical database model, data is organized into a tree like structure.
- The data is stored in form of collection of fields where each field contains only one value.
- The records are linked to each other via links into a parent-children relationship.
- In a hierarchical database model, each child record has only one parent. A parent can have multiple children.
- To retrieve a field's data, we need to traverse through each tree until the record is found.
- Hierarchical structure is simple, it is inflexible due to the parent-child one-to-many relationship.
- Hierarchical databases are widely used to build high performance and availability applications usually in banking and telecommunications industries.
- **The IBM Information Management System (IMS) and Windows Registry are two popular examples of hierarchical databases.**

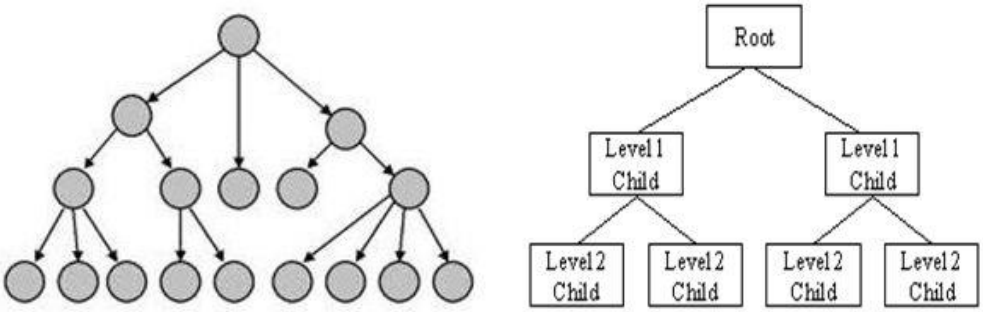


Figure 3.9 Hierarchical Database Management System

c. Network Database Management System

- Network database management systems use a network structure to create relationship between entities.
- Network databases are mainly used on a large digital computer.
- Network databases are hierarchical databases but unlike hierarchical databases where one node can have one parent only, a network node can have relationship with multiple entities. A network database looks more like a cobweb or interconnected network of records.
- In network databases, children are called members and parents are called occupier. The difference between each child and member can have more than one parent.
- The approval of the network data model is similar to a hierarchical data model. Data in a network database is organized in many-to-many relationships.
- **Some of the popular network databases are Integrated Data Store (IDS), IDMS (Integrated Database Management System), Raima Database Manager, TurboIMAGE and Univac DMS-1100.**

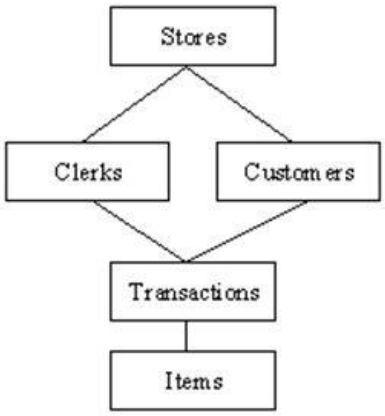


Figure 3.10 Network Database Management System

d. Object – Oriented Database Management System

- In this Model we have to discuss the functionality of the object-oriented Programming.
- It takes more than storage of programming language objects.
- Object DBMS's increase the semantics of the C++ and Java.
- It provides full-featured database programming capability, while containing native language compatibility.
- It adds the database functionality to object programming languages. This approach is the analogical of the application and database development into a constant data model and language environment.
- Applications require less code, use more natural data modelling and code bases are easier to maintain.
- The object-oriented database derivation is the integrity of object-oriented programming language systems and consistent systems.
- The power of the object-oriented databases comes from the cyclical treatment of both consistent data, as found in databases and transient data, as found in executing programs.
- Object-oriented databases use small, recyclable separated of software called objects. The objects themselves are stored in the object-oriented database. Each object contains of two elements:
  - Piece of data (example: sound, video, text or graphics).
  - Instructions or software programs called methods for what to do with the data.
- **Some popular software is TORNADO, Gemstone, ObjectStore, GBase, VBase, InterSystems Cache, Versant Object Database, ODABA, ZODB, Poet. JADE and Informix.**

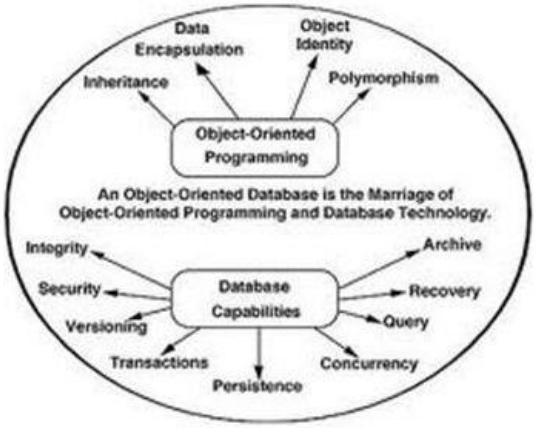


Figure 3.11 Object – Oriented Database Management System

3.2.3 Data Warehouse and Data Mining

a. Data Warehouse

- Database can store large amounts of data
- Capable of accessing and analysing data in need to decision makers throughout the company.
- Data can be accessed faster and more effectively.
- It is scattered in many different locations using a network connection.
- Organized according to the organization's requirement
- The data originate in many core operational transaction systems, such as systems for sales, customer accounts and manufacturing and may include data from Web site transactions.
- These data are combined with data from external sources and transformed by correcting inaccurate and incomplete data and restructuring the data for management reporting and analysis before being loaded into the data warehouse.
- Makes the data available for anyone to access as needed, but it cannot be altered.
- Provides a range of ad hoc and standardized query tools, analytical tools and graphical reporting
- **Characteristic of a Data Warehouse:**
  - Data are organized by subject
  - Data are consistent as different database are encoded
  - Data can store for many years and can be accessed at any time
  - Data remain as it is once it is stored
  - Data are stored permanently and cannot be removed
- **The Advantages of Using a Data Warehouse are:**
  - End – users can access data easily and quickly
  - Data can be analysed accurately and efficiently
  - Data in a data warehouse are integrated with each other and it will be easier for users to access data
  - Ease the use of data among the end – users
  - Organizations have the potential to achieve high returns
  - Enables organizations to increase their productivity

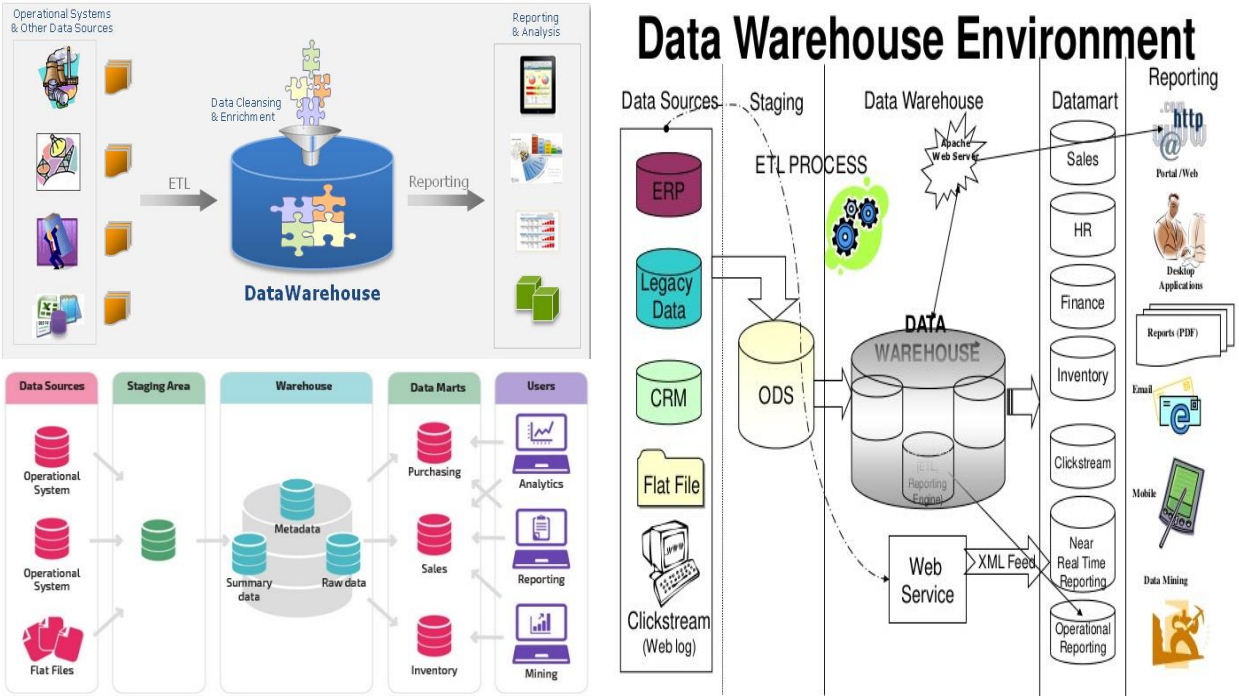
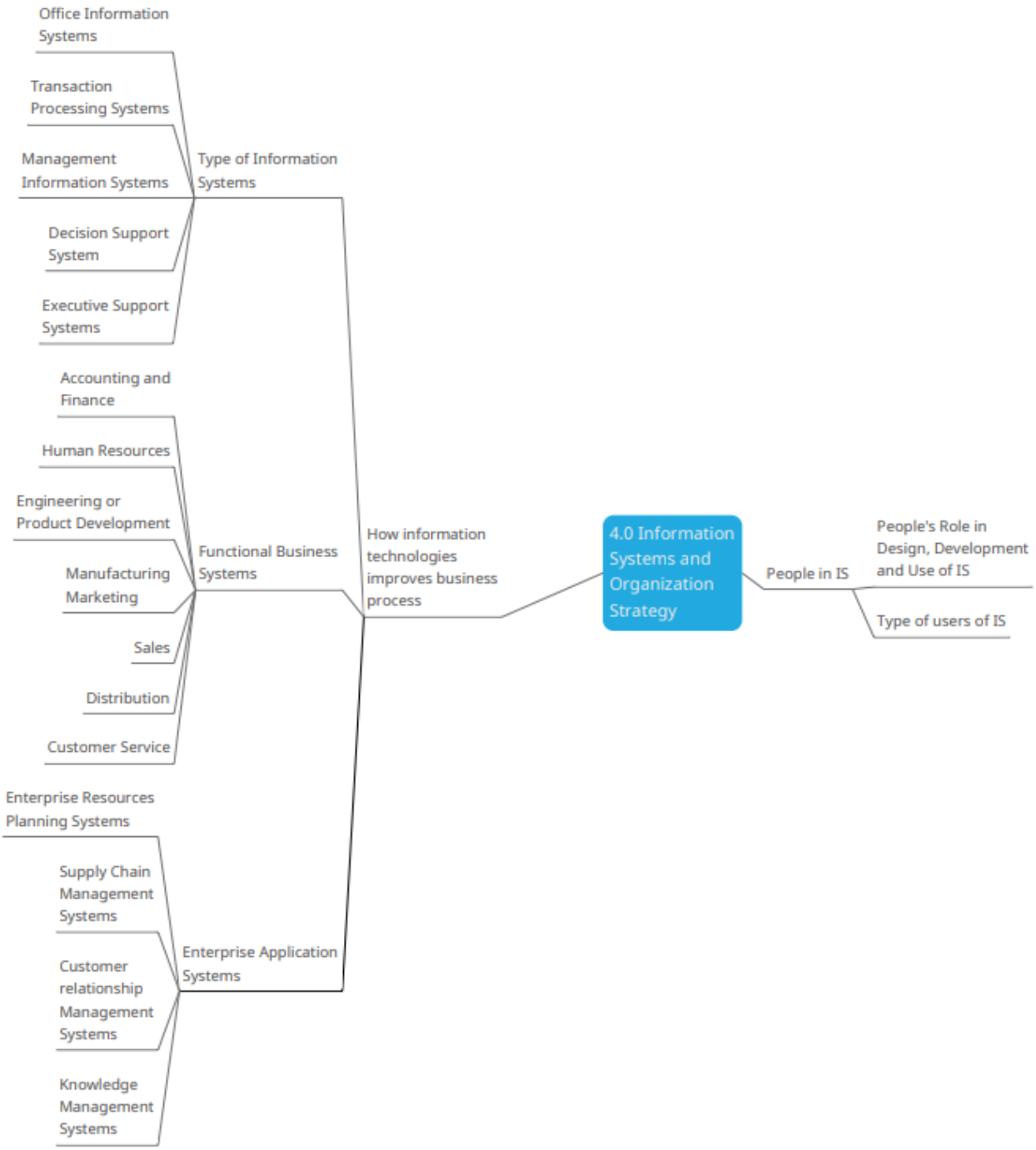


Figure 3.12 Data Warehouse

b. Data Mining

- Process of accessing and analysing data in a data warehouse or data mart.
- More discoveries – driven.
- Provides insights into corporate data that cannot be obtained with OLAP by finding hidden patterns and relationships in large databases
- The patterns and rules are used to guide decision making and forecast the effect of those decisions.
- Discovers hidden patterns and operates on a more detailed level instead of a summary level.
- The information obtainable from data mining include associations, sequences, classifications, clusters and forecasts
- **Example: Data Mining could be used to gain awareness of customer behaviour or patterns in the region.**
- These systems perform high level analyses of patterns or trends but they can also drill down to provide more detail when needed.
- One popular use for data mining is to provide detailed analyses of patterns in customer data for one – to – one marketing campaigns or for identifying profitable customers
- Supports decision makers through a process referred to as knowledge discovery.

CHAPTER SUMMARY



Chapter Revision

SECTION A:
Structure Questions

1. Elaborate the following data management terms:

   a) Data

   _____

   _____

   b) Information

   _____

   _____

   c) Knowledge

   _____

   _____

2. Point out **SIX (6)** limitation in traditional file processing.

   a) _____
   b) _____
   c) _____
   d) _____
   e) _____
   f) _____

3. Explain these information system development methodologies:

   a) System Development Life Cycle (SDLC) methodology

   _____

   _____

   b) Lean Methodology

   _____

   _____

4. List any FIVE (5) programming tools

   a) _____
   b) _____
   c) _____
   d) _____
   e) _____

CHAPTER 4

INFORMATION SYSTEMS AND ORGANIZATION STRATEGY

4.1 HOW INFORMATION TECHNOLOGIES IMPROVES BUSINESS PROCESSES

4.1.1 Types of Information System

a. Office Information System (OIS)

- Help people perform personal record keeping, writing and calculations efficiently.
- Main types of tools include spread sheet programs, text and image processing systems, personal database systems and note-taking systems

b. Transaction Processing System (TPS)

- An information processing system for business transactions involving collections, modifications, sorting, listing, merging, updating and retrieval of data transactions.
- Helps capture the information necessary to update fundamental operations of an organization.
- Tracks down routine operations but does not provide much support for decision – making.
- End result of processing a transaction would be updated records based on the last updated transaction.
- **Example: Zahida buys an orange shirt by cash at Tesco. This activity is known as sales transaction. It also affects other transactions. Firstly, through the purchase, the amount of cash at the cashier's counter has just increased. Secondly, the inventory for orange shirt has just reduced by one unit. These transactions are connected as they occur on the same day at the same time and involve the same item.**
- System that serves businesses at their operational level
- The output includes all kinds of detailed reports, lists and summaries.
- The users of this system are generally operational staff and supervisors.
- TPS produces valuable input for other systems such as MIS and DSS, where it serves as a foundation.
- **Example: Irfan has a bank account with Maybank. All activities related to Irfan's account such as withdrawals, online transfers, deposits, fees and so forth are tracked and recorded by TPS. If Irfan have intention for applying car loan, the account's records would be useful information in determining if he is eligible; however, it is not sufficient for the bank to decide. The bank would still require integrated information from different sources and the analysis of Irfan's financial profile.**

c. Management Information System (MIS)

- Use to support decision making.
- To gather and analyse numerous features of organizations such as information on employees, inventory, production and marketing.
- Can be used to help Managers, departments or individuals evaluate the performance of organizations
- Creates reports on various functions in the organizations such as reports on sales, revenue and production.
- Managers are able to spot trends and do an analysis by comparing the reports generated daily, weekly or monthly
- **Example: As soon as a sale is recorded by the TPS, the company's MIS will be updated with the information, allowing a Manager to see the sales report in real time, if necessary. Having information that is current, accurate and well – organized can help managers make better decisions for their organizations**
- Process data into useful information in the form of reports.
- The decision making is done by analysing reports.
- Assist Managers in operational level to make structured decision.
- **Benefits of MIS:**
  - Assists Managers in making decisions through reports.
  - MIS facilitates the monitoring of a company's operations as data from various points of transaction that are collected and stored.

- It also raises efficiency in decision – making
- It provides integrated information collected from various departments in an organization
- Enables Managers to forecast trends by making comparisons and references

- **Challenges of MIS:**
  - MIS cannot replace managerial judgement in decision – making and problem solving.
  - The quality of MIS output is proportional to the input, therefore if the system does not capture the input process properly, it will affect the quality of the output
  - MIS may not be flexible enough to update itself in the fast-changing business environment
  - MIS will be less effective in organizations where information is not shared

d. Decision Support System (DSS)

- Provides interactive decision support for Managers in decision making.
- **Example: Choosing a site for a factory – In deciding a new location for a factory, a Manager may rely on some structured components (example: cost of land or availability of workers). But at the same time, there are also other unstructured components in this decision (example: quality of life). DSS can interactively show the suitability of the land by presenting the contamination index with the increase in population or the waste produced every time production increases.**
- **Example: Marketing and Promotion – In deciding the budget and allocations for marketing and promotion, a Sales Manager relies on reports from the MIS. The reports contain information on sales performance of the products or marketing budget for a campaign. The DSS however, can interactively show a Sales Manager the effect on the sales performance every time there is a change in budget.**
- **Benefits of DSS:**
  - DSS improve the efficiency of a decision making
  - It provides alternatives to a solution.
  - Reveals new approaches to problem solving
- **Challenges of DSS:**
  - Cause of confusion and misperception among users.
  - User become too dependent on the system
  - May promote cognitive bias
  - There can also be information overload, providing too many options can lead to deficiency in decision
  - If a decision turns out badly, people tend to blame the system rather than take the blame themselves
  - Using DSS without sufficient information may lead to poor decision making because not all factors have been considered

e. Executive Support System (ESS)

- It combines many features of MIS and DSS.
- To meet the needs of Top Executives who need immediate and easy access to information on the organization's performance.
- **Example: The Executives of a retail hypermarket such as Giant and Mydin, use an integrated supply chain Information System as critical to its success and survival.**
- **Benefits of ESS:**
  - Designed to fulfil the decision-making needs of Top-Level Executives
  - Provides complete information to decision makers in a highly summarized but convenient form.
  - The presentation is usually in graphical form, making it easier for decision – makers to monitor performance and identify problems.
  - Provide the user with only the information most needed, leaving out the less important data
- **Challenges of ESS:**
  - ESS capabilities are limited, as it not designed to perform the complex operations
  - It might lead to less reliable and insecure data since ESS deals with a huge amount of data

4.1.2 Enterprises Application System

a. Enterprise Resource Planning (ERP) Systems

- Use a system of integrated applications to run the business (organizational functions, integration and data sharing)
- Integrated business functions of a company including planning, sales, customer relations, resource management, manufacturing, logistics, distribution, accounting, finance, inventory control, order tracking, human resources, marketing, financial and management
- It plays a role in integrating and accomplishing the cross – functional processes.
- Many companies use ERP to gain agility, competitiveness, efficiency, effectiveness and responsiveness.
- Enables flexible and strategic decision making.
- To eliminate redundancies and inefficiencies

Figure 4.1 ERP Systems

- **Benefits of ERP:**
  - Improve quality and efficiency by creating a framework to integrate and improve the company's internal business processes.
  - ERP provides Managers with significant information on business performances in making better decision in a timely manner across the whole organization
  - Increase Cost Effectiveness by reduce the cost of operation in an organization.
  - Ease collaboration and sharing of information within department
  - Reduces the risk of losing confidential data as it is equipped with security.
  - Improve International Operations by supports various types of tax structures, different currencies of the world and multiple languages.
- **Challenge of ERP:**
  - Employees are reluctant to accept and get involved with the changes made in the organization
  - Managers are not given the empowerment and support to implement the business process changes
  - Many companies under fund to support expensive software package
  - Lack of Training and Education – Users are required to attend training given by the vendor and knowledge of the selected software package when they perform their daily tasks
  - Lack of attention to the critical management issue –Managers not taking the responsibility on management issue

b. Supply Chain Management (SCM) Systems

- Aim to move the correct amount of product from source to point of consumption as quickly as possible at the lowest cost

- Used by firms to manage relationships with suppliers, purchasing firms, distributors and logistic companies through shared information about orders, production or inventory levels
- Oversees the flow of materials, information and finance as they move in a process from the supplier to the end customer.
- With SCM, it will automate the flow of information across organizational boundaries.
- **Example: Manufacturers may keep too many parts in inventory because they do not know exactly when they will receive their next shipments from their suppliers. Suppliers may order few raw materials because they do not have precise information or demand. These supply chain inefficiencies waste as much as 25% of a company's operating costs.**

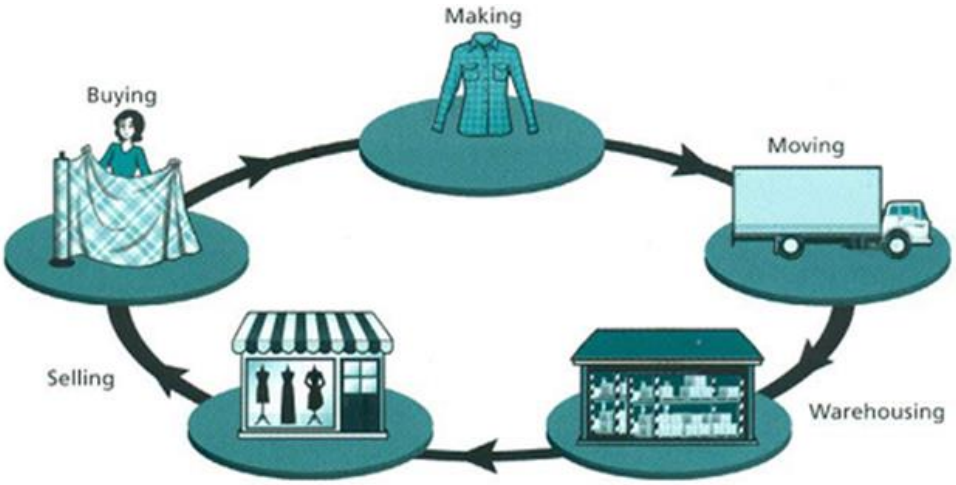


Figure 4.2 Basic Process Involved in Supply Chain Management of an Organization

- **Benefits of SCM:**
  - It helps businesses plan their supply chain.
  - Enable the firm to generated demand forecasts for products and develop optimal sourcing and manufacturing plans.
  - Help companies make better decisions such as determining how much of a specific product to manufacture in a given time period, establishing inventory levels for raw materials, intermediate products and finished goods, determining where to store finished goods and identifying the transportation mode to use for product delivery.
  - It helps companies to optimize its network of suppliers, plants and distribution centers
  - Developing an accurate forecast of customer demands
  - Improved material management – This reduces cost on raw materials, procurement, safety stocks and raw materials and finished goods inventory.
  - This function will also make sure that the materials required for production are available in the right place at the right time
  - It optimizes planning and scheduling with consideration on resources, material and dependency constraints
  - This ensure commitment to delivery dates in real time by fulfilling orders from all channels on time with order management, transportation planning and scheduling
  - They track the physical status of goods, the management of materials, warehouse and transportation operation and financial information involving all parties.

- **Challenges of SCM:**
  - Trying to forecast too far– Companies will expect an unrealistic and ambitious return when forecasting
  - Lack of training – Employees do not receive sufficient training from the vendors, resulting in insufficient knowledge and confidence in executing their job

- Lack of communication between vendors and company – Inadequate amount of information received by the vendor will cause unexpected outcome for the company
- The system itself could not integrate well with existing systems, thus causing lack in the information flow from the points of SCM production to the point of consumption
- Lack of information on the vendors' reputation – The company did not do a research on the vendors' reputation to ensure that they are investing with the right vendor at the most appropriate cost

c. Customer Relationship Management (CRM) Systems

- To manage interactions with current and potential customers.
- Helps a company to manage customer relationship in a well-organized manner.
- Allows a business and its employees to deliver fast, appropriate and reliable services to its customers
- Capture and integrate customer data from all over the organization, consolidate the data, analyse the data and then distribute the results to various systems and Customer Service across the enterprise.
- Customer Service are the methods of interaction with the customer, such as telephone, e – mail, customer service desk, conventional mail, Facebook, Twitter, Web Site, wireless device or retail store.
- Increase their productivity by focusing sales efforts on the most profitable customers.
- Provide sales prospect and contact information, product information, product configuration capabilities and sales quote generation capabilities.
- Increase the efficiency of call centres, help desks and customer support staff.
- Provide inquiring customers personalized support information
- CRM systems support direct – marketing campaigns by providing capabilities for capturing prospect and customer data for providing product and service information, for qualifying leads for targeted marketing and for scheduling and tracking direct – marketing mailings or e – mail.
- It include tools for analysing marketing and customer data, identifying profitable and unprofitable customers, designing products and services to satisfy specific customer needs and interests and identifying opportunities for cross – selling

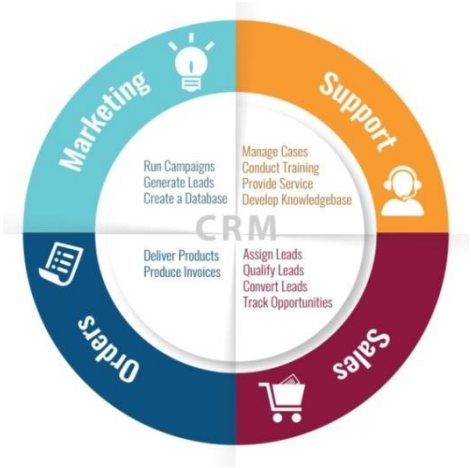


Figure 4.3 Well-designed CRM systems that provide a single enterprise view of customers that is useful for improving both sales and customer service

- **Benefits of CRM:**
  - CRM allows a business to find and aim at the most suitable customers so they can be retained as lasting customers for greater and more profitable services
  - The CRM also allows businesses to make customization and personalization of products and services according to its customer's needs, wants and purchasing behavior
  - Understand the customers
  - Retain customers through better customer experience
  - Attract potential customers
  - Win new clients and contracts
  - Increase profitability

- Decrease customers management costs
- CRM can keep track when customers contact the company
- CRM helps a company to provide a customer experience and support based on the customer's choices

- **Challenge of CRM:**
  - Lack of understanding and preparation upon implementing the systems
  - Lack of integration between CRM and the core business systems
  - Lack of end-user encouragement which leads to poor user acceptance rates
  - Inadequate preparation to change

d. Knowledge Management System (KMS)

- KMS lets an organization gather, organize and share business knowledge within an organization.
- KMS contains a central repository of information
- It is well structured and employs a variety of search tools which are effective and easy – to – use to help users find answers to questions fast.
- **Example: The Doctor discovers a new method of treating a certain illness and shares this knowledge in the repository. This can lead to better treatment methods or perhaps better drugs. Users are going to frequently access the knowledge repository and this will result in the development of best practices, policies and business solutions based on this knowledge. This knowledge of course can be used to facilitate decision making, which points to the first imperative**
- KMS refer to the set of business processes developed in an organization to create, store, transfer and apply knowledge.
- KMS increases the ability of the organization to learn from its environment and to incorporate knowledge into its business processes.

4.1.1 Functional Business Systems

a. Accounting Information System (AIS)

- For tracking accounting activities with information system technology
- To record and generate organizational transactions, financial statements and other economic events.
- AIS are a computer-based system that controls and produces important financial statement of financial statement such as the statement of profit or loss and other income and statement of financial position.
- Forecasts of future scenarios of a company such as projected financial statements and budgets.
- It encompasses legal and historical record keeping and the production of accurate financial statements.
- The process includes the transaction processing system such as order processing, inventory control, accounts receivable, account payable, payroll and general ledger systems.

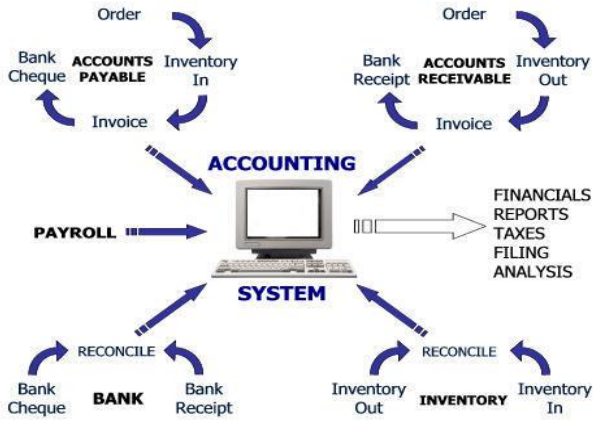


Figure 4.5 Functions of AIS

b. Finance Management System (FMS)

- Uses to observe, manage and administrate their revenue, expenditures and properties with the intention of making the most profits and ensuring sustainability.
- A good and effective FMS is capable of improving a company's short- and long-term performance.
- It is capable of assisting business professionals and Top Management in making critical decisions on future financial condition.
- Decision making supports by FMS are concerning the financing of business, allocation and control of financial resources within an organization.
- Financing Process include Capital Budgeting, Investment Management, Cash Management and Financial Planning

c. Human Resources Information System (HRIS)

- It controls a group of people in organizing employees who are working in a firm.
- Effective staffing and right sizing
- Automation of HRM operation processes
- Consolidated HRM information
- Better communication, horizontal integration & streamlined processes
- Improve paperless HRM capabilities
- Provide open flexible system
- Provide support in planning to meet employees' needs and performances
- **Example: Organizations started using computer – based information systems to generate salary and payroll reports, evaluate the use of employees in business operations, maintain employees' record, recruitment, selection and hiring, job placement, performance appraisals, employees' benefit analysis, training and development, health, safety and security**

d. Engineering or Product Development

- Systems engineering is an interdisciplinary field of engineering and engineering management that focuses on how to design and manage complex systems over their life cycles.
- Issues such as requirements engineering, reliability, logistics, coordination of different teams, testing and evaluation, maintainability and many other disciplines necessary for successful system design, development, implementation and ultimate decommission become more difficult when dealing with large or complex projects.
- Systems engineering deals with work-processes, optimization methods and risk management tools in such projects. It overlaps technical and human-centred disciplines such as industrial engineering, process systems engineering, mechanical engineering, manufacturing engineering, control engineering, software engineering, electrical engineering, cybernetics, organizational studies, civil engineering and project management. Systems engineering ensures that all likely aspects of a project or system are considered and integrated into a whole.

e. Manufacturing Information System (MFIS)

- To support the production or operational function of an organization.
- This includes all activities from planning, controlling inventories and raw materials, purchases and processes of producing goods or services, designing, production and monitoring

f. Marketing Information System (MKIS)

- MKIS is concerned with the planning, promotion and sales of current products, the development of new products and market strategies to better serve present and potential customers.
- The benefits of MKIS to any organization are:
  - ✓ Sharing of information and working virtually among Managers from different units of the company
  - ✓ Creating collaboration between marketers and customers on product design and customers' need

- ✓ Addressing operational needs through customer management systems that focuses on the day – to – day operations of customers transactions from the initial sale through customer service
- ✓ Make available customers' data and feedback that can assist the company in aligning with customer needs
- ✓ Predicting customers buying trends and behavior through the analysis of sales and revenue reports

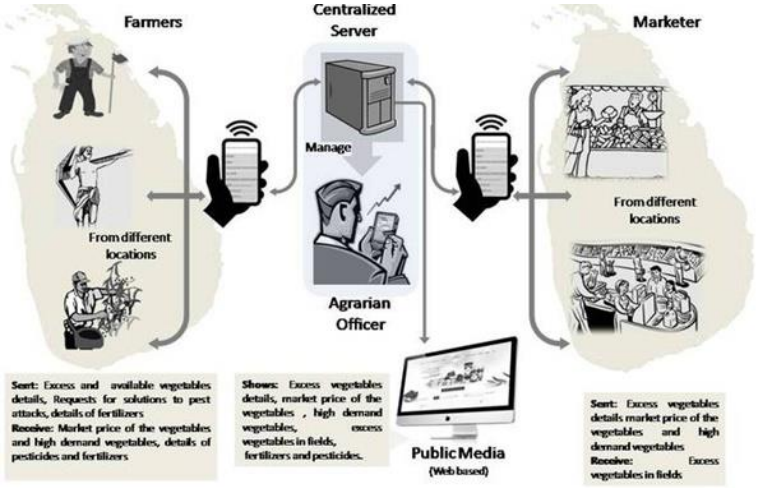


Figure 4.6 MKIS for Agriculture

g. Sales

- Marketing and sales information is formally gathered, stored, analysed and distributed to managers in accordance with their informational needs at regular intervals on a planned basis.
- The marketing and sales information system is built upon an understanding of the informational needs of marketing and it supplies that information when, where and how the managers require it. Data are derived from the marketing environment and transferred into information that marketing managers can use in their decision making.
- Sales information system has four components such as collection of data from internal sources on continuous basis and ad hoc basis, scanning of environment and marketing research

h. Distribution

- Distribution management refers to overseeing the movement of goods from supplier or manufacturer to point of sale.
- Distribution management is an overarching term that refers to numerous activities and processes such as packaging, inventory, warehousing, supply chain and logistics.
- A logistics management information system is a system of records and reports used to aggregate, analyse, validate and display data (from all levels of the logistics system) that can be used to make logistics decisions and manage the supply chain.

i. Customer Service

- Customer service system is a configuration of technology and organizational networks designed to deliver services that satisfy the needs, wants or aspirations of customers.
- "Service system" is a term used in the service management, service operations, services marketing, service engineering and service design literature.

4.2 THE PEOPLE IN INFORMATION SYSTEMS

4.2.1 Roles of People in the Design, Development and Use of Information Systems

The Information Systems Department consists of specialists such as Programmers, Systems Analysts, Project Leaders and Information Systems Managers.

- **Programmers** are highly trained technical specialists who write the software instructions for computers
- **System Analysts** constitute the principal liaison between the information systems groups and the rest of the organization. It is the Systems Analyst's job to translate business problems and requirements into information requirements and systems
- **Information Systems Managers** are leaders of teams of Programmers and Analysts, Project Managers, Physical Facility Managers, Telecommunication Managers or Database Specialists. They are also Managers of Computer Operations and Data Entry Staff
- External Specialist such as **Hardware Vendors** and Manufacturers, **Software Firms** and **Consultants**, frequently participate in the day – to – day operations and long – term planning of information system
- In many companies, the Information Systems Department is headed by a **Chief Information Officer (CIO)**. The CIO is a Senior Manager who oversees the use of information technology in the firm. Today's CIOs are expected to have a strong business background as well as information systems expertise and to play a leadership role in integrating technology into the firm's business strategy. Large firms today also have positions for a Chief Security Officer, Chief Knowledge Officer and Chief Privacy Officer, all of whom work closely with the CIO
- **The Chief Security Officer (CSO)** is in charge of information systems security for the firm and is responsible for enforcing the firm's information security policy. Sometimes this position is called the Chief Information Security Officer (CISO) where information systems security is separated from physical security. The CSO is responsible for educating and training users and information systems specialists about security, keeping management aware of security threats and breakdowns and maintaining the tools and policies chosen to implement security
- Information systems security and the need to safeguard personal data have become so important that corporations collecting vast quantities of personal data have established positions for a **Chief Privacy Officer (CPO)**. The CPO is responsible for ensuring that the company complies with existing data privacy laws
- The **Chief Knowledge Officer (CKO)** is responsible for the firm's knowledge management program. The CKO helps design programs and systems to find new sources of knowledge or to make better use of existing knowledge in organizational and management processes

4.2.2 Identify the Different Types of User of Information Systems

End users are representatives of departments outside of the information systems group for whom applications are developed. These users are playing an increasingly large role in the design and development of information systems.

Level	Role	Position
Strategic Top-Level Managers	Develop overall organisational goals, policies and strategies and steer the firm towards achieving them.	Chief Executive Officer (CEO), Chief Financial Officer (CFO), Chief Operational Officer (COO), Chief Information Officer (CIO), Chairperson of the Board, President, Vice President, Corporate head
Tactical Middle-Level Managers	Responsible for carrying out the goals that have been set by the Top Managers.	General Manager, Plant Manager, Regional Manager and Divisional Manager.

Operational First Level Managers	They are involved in the daily running of their work unit in their organisations	Office Manager, Line Manager, Department Manager, Supervisor and Store Manager.

Table 4.1 Type of Users of Information System

Chapter Revision

SECTION A:
Structure Questions

BIL	DESCRIPTION	BENEFIT	CHALLENGES
TYPES OF INFORMATION SYSTEMS			
1	Office Information Systems (OIS)		
2	Transaction Processing Systems (TPS)		
3	Management Information Systems (MIS)		
4	Decision Support Systems (DSS)		
5	Executive Support Systems (ESS)		
ENTERPRISE APPLICATION SYSTEMS			
6	Enterprise Resource Planning Systems (ERP)		
7	Supply Chain Management Systems (SCM)		
8	Customer Relationship Management Systems (CRM)		
FUNCTIONAL BUSINESS SYSTEMS			
9	Accounting Information Systems (AIS)		
10	Finance Management Systems (FMS)		
11	Human resource Information Systems (HRIS)		
12	Engineering or Product Development		
13	Manufacturing Information Systems (MFIS)		
14	Marketing Information Systems (MKIS)		
15	Sales		
16	Distribution		
17	Customer Service		

2. Elaborate the following **FIVE (5)** types of information systems

BIL	TYPE	ELABORATION
1	Office information systems (OIS)	
2	Transaction Processing Systems (TPS)	
3	Management Information Systems (MIS)	
4	Decision Support Systems (DSS)	
5	Executive Support Systems (ESS)	

3. Identify the following functional business systems.

a) Accounting Information systems (AIS)

_____
_____

b) Finance Management Systems (FMS)

_____
_____

c) Human resources Information Systems (HRIS)

_____
_____

d) Engineering of Product Development

_____
_____

e) Marketing Information Systems (MKIS)

_____
_____

CHAPTER 5

INFORMATION SYSTEM DEVELOPMENT

5.1 THE OVERALL PROCESS OF DEVELOPING INFORMATION SYSTEM

5.1.1 Categorize the Alternative Systems Building Approaches

a. System Development Life Cycle (SDLC)

- SDLC methodology is a phased approach to build a system.
- The activities can be grouped into a cycle of sequential phases as illustrated in Figure5.1.
- SDLC is an effective roadmap for the project team. It helps to track the status of the project.

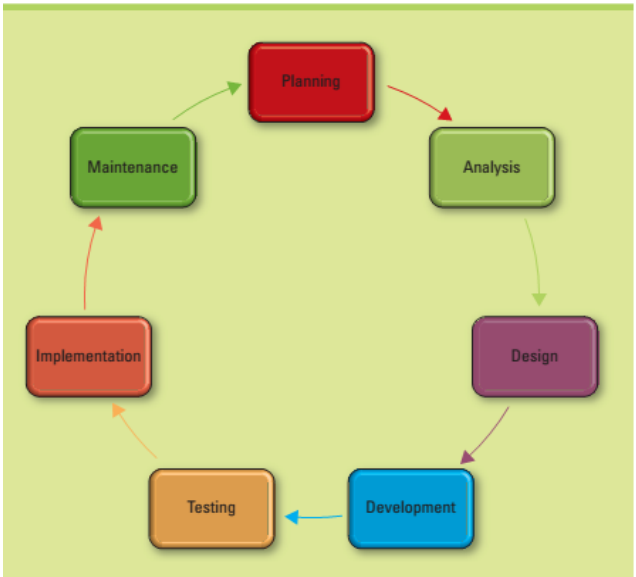


Figure 5.1 System Development Life Cycle (SDLC) Phases

Phase 1: Planning

- Brainstorm issues or problem in an organization
- Identify opportunities for the organization
- Prioritize and choose projects for development
- Set the project scope and plan (describe the business need, the problem of the project will solve, justification, requirements and boundaries for the projects)
- **Example: Develop a system that allows customers to order product online or Determine the best logistical structure for warehouses around the world**

Phase 2: Analysis

- Gather the business requirement (specific business requests) for the system to be successful
- Define any constraints associated with the system
- This phase is critical because business requirements drive the entire systems development effort
- Defining the problem; identifying its causes and specifying the solution that must met by a system solution.
- Identifies several alternative solutions, describes the costs and benefits and the advantages and disadvantages of each alternative
- **Example: The CRM System must track all customers' inquiries by products and regions**

Phase 3: Design

- Establishes descriptions of the desired features and operations of the system, including screen layouts, business rules, process diagrams, pseudo code (Informal high-level description of the operating principle of a computer program or algorithm) and other documentation.
- Turns the project focus to the physical or technical point of view

- Define the technical architecture that will support the system, including data models, screen designs, report layouts and database models.
- It consists of all the specifications that give the system its form and structure.
- The systems designer details the system specifications that will deliver the functions identified during systems analysis.
- **Example of design specifications:** Output (Medium, content and timing), Input (Origins, flow and data entry), User interface (Simplicity, efficiency, Logic, Feedback) and Database design (Volume, speed, file organization, record specification)

Phase 4: Development

- Build the technical architecture, database and applications
- The development phase takes all the detailed design documents from the design phase and transforms them into the actual system.
- During development, the company implements the equipment necessary to support the architecture.
- Software engineering is a disciplined approach for constructing information systems
- During development, the team defines the programming language it will use to build the system.

Phase 5: Testing

- Write test conditions (detail the steps the system must perform with the expected result of each step)
- Perform system testing
- The testing will eliminate errors and bugs and verify that the system meets all the business requirements defined in the analysis phase.
- Bugs are defects in the code of an information system.
- Testers execute test conditions and compare the expected results with the actual results to verify the system functions correctly.
- Each time the actual result is different from the expected result, a “bug” is generated and the system must be fixed in development.

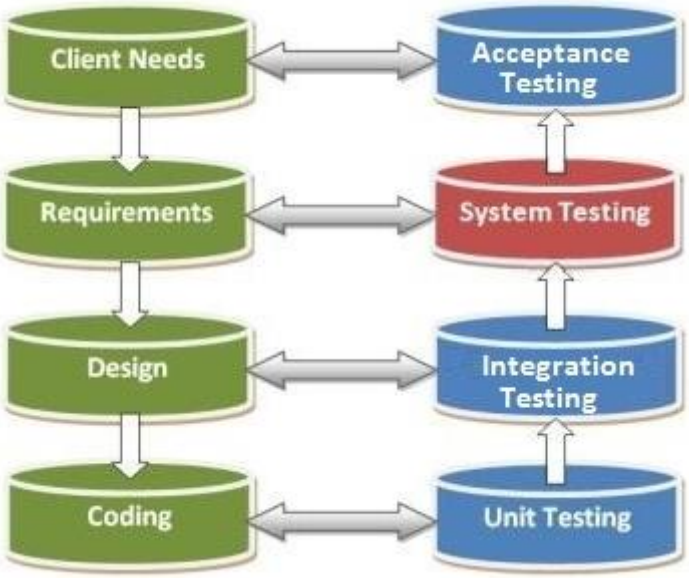


Figure 5.2 System Testing

Phase 6: Implementation

- Write detailed user documentation
- In the implementation phase, the organization places the system into production so users can begin to perform actual business operations with it.

- In this phase, the detailed user documentation is created that highlights how to use the system and how to troubleshoot issues or problems.
- Training is also provided for the system users and can take place online or in a classroom.
- Online training runs over the Internet or on a CD or DVD and employees complete the training on their own time
- Workshop training is held in a classroom environment and led by an instructor.
- To support users is to create a help desk or a group of people who respond to users' questions.

Phase 7: Maintenance

- Build a help desk to support
- Provide an environment to support system changes
- In the maintenance phase, the organization performs changes, corrections, additions and upgrades to ensure the system continues to meet business goals.
- Corrective maintenance makes system changes to repair design flaws, coding errors or implementation issues.
- Preventive maintenance makes system changes to reduce the chance of future system failure.
- During the maintenance phase, the system will generate reports to help users and Management Information System specialists ensure it is functioning correctly.

b. Rapid Application Development (RAD) Methodology

- RAD has become a popular route for accelerating systems development.
- RAD methodology (also called rapid prototyping)
- Emphasizes extensive user involvement in the rapid and evolutionary construction of working prototypes of a system
- To accelerate the systems development process.
- Creating workable systems in a very short period of time.
- RAD can include the use of visual programming and other tools for building graphical user interfaces, iterative prototyping of key system elements, the automation of program code generation and close teamwork among end users and information systems specialists.
- The process does not have to be sequential and key parts of development can occur simultaneously.
- RAD is executed with minimal planning in favour of rapid prototyping.
- The development process is broken down into components or functions and they are developed in mini projects.
- Focus initially on creating a prototype that looks and acts like the desired system
- Actively involve system users in the analysis, design and development phases.

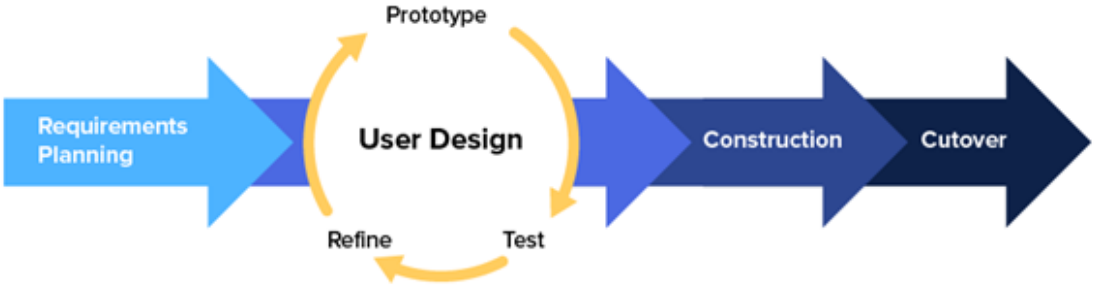


Figure 5.3 Rapid Application Developments

c. End User Development

- End user development describes any systems development projects where the users (executives, managers or even data entry personnel) assume the primary effort
- With end user development, managers and other users can get the systems they want without having to wait for the IT professionals to develop and deliver them.

- End user development, however, tends to be risky as often these users do not have the training to effectively develop and tests the systems and some of the systems are poorly documented
- End user development should be used as a supplementary to the SDLC

d. Application Software Packages and Outsourcing

- Application Software Packages
  - Purchasing an existing system form an external vendor such as IBM, SAP and SAS is referred to as external acquisition
  - Buying pre-packaged software can save development time and effort
  - However, the software may need to be customized according to requirements.
  - There are two types of packaged software:
    a) Horizontal market software is designed to be generic and covers the wider needs of an enterprise
    b) Vertical market software is used to fulfil a very specific need. Example: banking, hospitals, libraries and airlines
- Outsourcing
  - Information technology outsourcing is an alternative solution to in house development
  - This choice frees and enterprise to focus on its core business
  - An enterprise does this by contracting some or all of its ICT functions to professional solution providers, which include data centres, telecommunication networks, application developers and cloud computing
  - Outsourced ICT functions range from infrastructure to software development, maintenance and support

5.1.2 Programming Languages and Tools

Programming language refers to high-level languages, such as BASIC, C, C++, COBOL, FORTRAN, Ada and Pascal. During development, programming language will be used to build the system.

Programming Languages	What is Uses	Example of How to Writing	Example of Name Language
First Generation Machine Languages	Binary coded instructions	1010 11001 1011 11010	0 and 1
Second Generation Assembly Languages	Symbolic coded instruction	LOD B ADD C	ADD – addition SUB - Subtraction
Third Generation High-Level Languages	Brief statement or commands such as INPUT, GET, PRINT	A = B + C 10 INPUT B, 20 INPUT C	COBOL, Fortran, BASIC, Pascal
Fourth Generation Fourth-Generation Languages	Natural and non-procedural statement (Programming languages that look similar to human languages and based on problem solving using constraint given to the program)	SUM NUMBERS (B, C)	Visual C++, SQL, PHP, Java
Fifth Generation	Designed to make a computer value a given problem without the programmer		Artificial Intelligent

Table 5.1 Programming Languages

Chapter Revision

SECTION A:
Multiple Choice Questions

1. Statement below explain on how Management Information System can improve business **EXCEPT**.
   A. Computerized database of financial information.
   B. Obtaining report from the system.
   C. Reduce cost of computer infrastructure.
   D. Collecting data automatically for support system.

2. Customer Relationship Management System is a _____.
   A. Management System that capture data from all over the organization, consolidate the data, analyse the data so that it can use as interaction.
   B. Management System that store and retrieve knowledge, improve collaboration, locate knowledge sources, mines repositories for hidden knowledge.
   C. Management System that coordinating and integrating the flow within and among companies in the area of logistics, procurement, and marketing.
   D. Management System that integrate database with application so end user easy to manage.

3. The second phase of System Development Life Cycle is _____.
   A. Design
   B. Maintenance
   C. Analysis
   D. Implementation

4. During the Design Phase in System Development Life Cycle, developer often use _____ which is a working model of the system with limited function.
   A. Joint Application Design (JAD)
   B. Prototyping
   C. Proposal
   D. Observation

5. Preparing documents for the users, giving training and begin after user acceptance of the system is a _____ stage.
   A. Design
   B. Maintenance
   C. Analysis
   D. Implementation

SECTION B:
Structure Questions

1. Identify the **SEVEN (7)** system development life cycle (SDLC) phases.
   a) _____
   b) _____
   c) _____
   d) _____
   e) _____
   f) _____
   g) _____

2. Elaborate application software packages and outsourcing.

_____
_____
_____
_____
_____
_____
_____

3. Explain the benefits of Enterprise Resource Planning (ERP).

_____
_____
_____

4. Describe Supply Chain Management (SCM).

_____
_____
_____

CHAPTER 6

INFORMATION SYSTEMS IN SOCIETY AND THE WORLD

6.1 THE INFORMATION SYSTEMS IN SOCIETY AND THE WORLD

6.1.1 Roles of Information Technology in Globalization

- **Digital Firm**
  - Time shifting = business being conducted continuously 24 hours a day
  - Space shifting = work and business takes place in a global

- **Business Transformation**
  - Business use smartphone, texting, e – mail and online conferencing, media social, business web

- **Globalization**
  - By using Internet, costs of operating reduced and transaction made over a global.
  - **Example: Google and eBay offer its services worldwide without different layout**

- **Strategic Business Objectives**
  - Information systems are important tools for conducting business
  - **Example: banking industries such as M2U (Maybank), CIMB Click (CIMB Bank), irakyat (Bank Rakyat) help their customers to reach their service by using banking online**
  - **Example: e Commerce such as ebay, mudah.com and MPHonline help ease their customer in purchasing online**

6.1.2 The Impact of Globalization on Organizations

- Online collaboration and social networking software can improve coordination, collaboration and knowledge sharing. **Example: Google Apps, Microsoft Windows SharePoint Services and IBM Lotus Connections are used by business professionals worldwide to support project management, customer relationship management, social networking, blogs, project management, online meetings, personal profiles, social bookmarks and online communities**
- Enhanced decision making by data analytics, interactive application and software. It provide performance information to managers
- Reduce travel time and cost by live video and web conferencing technologies
- Improve collaboration and decision making by information system such as Executive Support System, Decision Support System, Enterprise Resource Planning, Supply Chain Management, Functional Business System, Transaction Processing System, Customer Relationship Management and Knowledge Management System
- Increase interaction with employees, customers and suppliers by social networking platforms as Facebook, Instagram, Twitter, Blog, Website, Email, WhatsApp and Telegram
- Work with many people by Internet, wireless laptops, smart phones and tablet computers
- Enhanced business value by collaboration with customers, business partner, offer solution and experiences

6.1.3 Discuss the Concept of Digital Divide in terms of Access to and Usage of Information and Communication Technology

- **Cloud Computing Platform**
  - Major business application are delivered online
  - Can access anytime, anywhere
  - Storage over the internet
  - Data and resources can be shared and stored on the internet
  - Data can be accessed over the internet
  - High computing power
  - Easy access

- Low cost
- High performance
- Mobility

- **Big Data**
  - Business get big data from web traffic, email messages, social media

- **Mobile Digital Platform**
  - Apple iPhones and Android phone able to download applications to support collaboration, location and communication. **For example: BizExpense Tracker, Dropbox, Salesforce Mobile, I Schedule, iWork, Document to go, PDF Reader Pro**
  - **iPad, Google Nexus, Kindle Fire use as platform for consumer and corporate computing**

6.2 Ethical and Legal Implications of Information Systems

6.2.1 Describe Ethical and Legal Implications of Information Systems

Ethics refer to the principle of right and wrong that individuals, acting as free moral agents use to make choices to guide their behaviours.

a. Privacy
- Privacy is the claim of individuals to be left alone
- Free from surveillance or interference from other individuals or organizations
- Privacy is the state of being free from unwanted intrusion or disturbance in one's private life
- Freedom to be alone.
- Information privacy is the right to have control over how your personal information is collected and used.
- Under the privacy law, individuals are prohibited to pass private information of users to other parties.
- **Example: with internet, personal information is now more accessible and easier to collect. Online transactions, financial payments, grants, grade reports and disciplinary actions are important elements for organizations such as universities and banks to function effectively. However, these transactions pose additional risks to privacy. Most businesses collect personal information from their websites and use them for telemarketing purposes or sell them to other companies for profit.**
- Malaysian Personal Data Protection Act (PDPA) 2010 is used to regulate the processing of personal data by data users in the context of commercial transactions that will safeguard the personal data

b. Accuracy
- The advancement of Internet technologies such as database management systems and cloud computing has contributed to the emergence of shared and computerized databases
- These technologies also enable organizations to carry out more complicated and interconnected processes
- These new technologies allow organizations the potential to collect, handle and distribute large amounts of data and contain a variety of information
- Hence, organizations have more data to work with in providing relevant information to assist managers in strategic, managerial and operational decision making
- Working with vast amounts of data may cause irreparable harm to organizations if inaccurate information is collected and/or disseminated to authorized users that can lead to inappropriate decision making
- Effective decision making is driven by accurate information
- Therefore, organizations must ensure that the information disseminated across and within the organization is accurate

c. Accessibility

- A person needs intellectual skills to cope with information and to use the information to its full potential
- Apart from intellectual skills the individual must also possess technical skills to access the information from electronically stored databases
- By using electronic shared databases, one has access to the information for a cost
- In the long run, the gap between those who can and those who cannot access the databases may create social problems in society

d. Intellectual Property

- In the software industry, intellectual property rights are the main concern of organizations, especially on issues of intangible rights ownership of an asset, such as a software program that includes source codes, object codes and ideas
- There are essentially four types of intellectual property rights relevant to software: patterns, copyrights, trade secrets and trademarks
- Other ways of protecting software owners is through trademarks and trade secrets to identify their software products, services and programs on packaging, promotional and advertising material. Using trademarks and trade secrets allow for a much longer lasting protection of the software

e. Copyright

- Is a statutory grant that protects creators of intellectual property from having their work copied by others
- It protects during the life of author plus an additional 70 years after the author's death.
- For corporate-owned works, it protects for last 95 years after their initial creation.
- Copyright protection includes books, lectures, dramas, musical compositions, maps, drawings and artwork
- Copyright encourage creativity and authorship by ensuring that creative people receive the financial and benefits of their work.
- It gives a protection of idea is expressed.
- In information systems, Copyright law protect software from being copied or interface.
- Software developers can protect their rights by obtaining patents for systems, methods, algorithms and functions embodied in the software
- **Example: Apple Computer sued Microsoft Corporation and Hewlett – Packard for having of the expression of Apple's Macintosh interface. They claimed that the defendant copied the expression of windows**

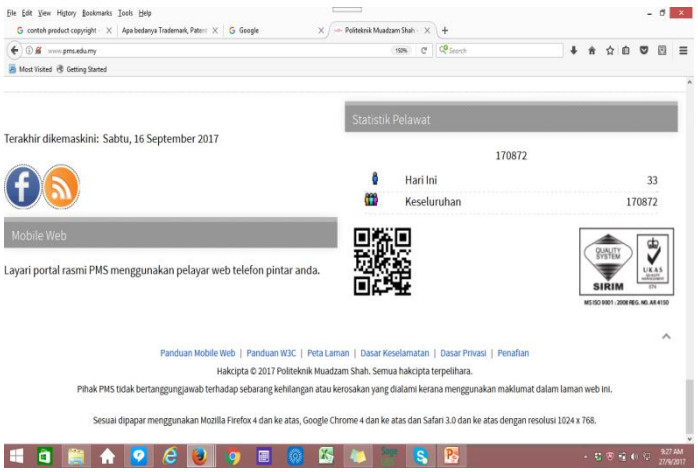


Figure 6.1 Example of Copyright

6.3 THE FUTURE OF MANAGEMENT INFORMATION SYSTEM

6.3.1 What is the Future of Management Information System

a) **Advancement of Technologies**

- The uses of fibre – optics and telecommunication, have increased the capabilities of information systems.
- Most information systems can compute, store and retrieve data quickly.
- Information systems have the capability to monitor information that go in and out of a network
- The advancement of Internet technologies such as database management systems and cloud computing has contributed of shared and computerized databases.
- These technologies enable organizations to carry out more complicated and interconnected process.
- It also allows organizations the potential to collect, handle and distribute large amounts of data

b) **Threats to Privacy**

- Threats to privacy will always be a concern to individuals
- There is a lot of technologies that are available could decrease the risks associated with privacy.
- The use of encryption technologies can protect data from unauthorized access.
- Organizations can also use anonymization technologies that automatically blur all personal information.
- Authentication will be use to verify that a channel is secure.
- Organizations can also use web browsers' interface technologies to display hidden information about cookies that can alert people to threats to their privacy and also remind them to set their privacy parameters

6.3.2 Internet Trends

a) **Mobile Technology**

- People find convenient move around using mobile device compared to desktop Personal Computer
- Increase mobility also affects the way in which organization work – increased collaboration, able to manage businesses anytime and anywhere, better marketing through mobile apps, better and quicker access to data in the cloud computing

b) **Social Media**

- Social media is the best way to pull in the crowd's attention.
- Companies view this as an opportunity of the mass and get them to participate in research and development or innovation of a product.
- People use social network to share ideas, opinions and products innovations and companies are capitalizing on this.

c) **Internet of Things (IOT)**

- Internet is a medium to send and receive data.
- Advancement in microchip technology, wireless radios and decreased costs on sensors can generate useful information to be equipped with these technologies so that it can be easily connected to, accessed and controlled via the Internet.
- Itis called the IOT because the ability to connect to everything such as sensors, metres, signals, motors or cameras make gathering data almost limitless.
- **Example: with IOT, we can monitor our home temperature while we are out of town, have more accurate weather forecast and find parking spaces through the use of sensors**

d) **Cloud Computing**

- Cloud computing uses the Internet as the platform for application and data
- Accessible anytime and anywhere.
- **Example: Users can communicate using Gmail, construct documents using Google Docs, synchronize important events and set reminders using Google Calendar, store files and folders using Google Drive.**

e) **Big Data**

- Data create value and companies are utilizing the technology available to collect more data from internal and external sources.
- The growth of social media has also created so much more unstructured data to become available to organizations.
- The IOT further contributes to the growth of data available to individuals as well as organizations.

f) **Information Age**

- By surfing the internet, people can find out anything, from anywhere at any time.
- We live in the information age; which facts are widely available to anyone who can use a computer.

Chapter Revision

SECTION A:
Multiple Choice Questions

1. Copyright, patent and trademark is the _____.
   A. Protection given to property (idea, invention, or process).
   B. Services given to property (idea, invention, or process).
   C. Codes of ethic to property (idea, invention, or process).
   D. None of the above.

2. The ability to control information that a company or institution has and use it only for the purpose of the company operational is _____.
   A. Personality Right
   B. Sociality Right
   C. Creativity
   D. Privacy

3. Patent and trademark are the _____.
   A. Idea given to property (ideas, invention, or process).
   B. Codes of ethic to property (ideas, invention, or process).
   C. Network given to the property (ideas, invention, or process).
   D. Protection given to property (ideas, invention, or process).

4. During the System Analysis Phase in System Development Life Cycle, the developer often _____.
   A. train end users on the current system.
   B. study on how the current system.
   C. make a proposal on the current system.
   D. develop a prototype on the current system.

5. The **FIRST** phase of System Development Life Cycle is _____.
   A. Design.
   B. Maintenance.
   C. Investigation.
   D. Implementation.

SECTION B:
Structure Questions

1. What is the meaning of the prototype?

   _____

   _____

2. List **FIVE (5)** reasons the prototype is needed in system development.

   a) _____

   b) _____

   c) _____

   d) _____

   e) _____

3. What is the meaning of System Development Life Cycle?

   _____

   _____

4. In System Analysis phase, various technique can be used to gather information before any system is developed. Explain **FIVE (5)** technique that can be used to gather information needed or data gathering.

   a) _____

   b) _____

   c) _____

   d) _____

   e) _____

5. Explain **FOUR (4)** characteristics of Open Source Software and give 1 (ONE) example of open source software.

   a) _____

   b) _____

   c) _____

   d) _____

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MANAGEMENT
INFORMATION SYSTEM