

**MANAGEMENT INFORMATION SYSTEM**  
**COURSE CODE: MGMT 2072**  
**CREDIT HOUR: 3**



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2012 E.C

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# CHAPTER ONE

## INTRODUCTION TO MANAGEMENT INFORMATION SYSTEM (MIS)

### 1.1 Chapter Objective

Dear learner, welcome to the module of management information system! In this introductory chapter of the module, you will learn the definition and concepts of MIS; system and subsystem; contemporary approaches of MIS; Evolutions of Information age, characteristics; information technologies of MIS; And the career sides of information technology. Comprehend the essence of the chapter so that you will be in a better position to easily understand the concepts of the upcoming chapters. Enjoy reading each section with curiosity.

Dear learner After studying this chapter, you have capable to did the following:

Define MIS

Describe what system and sub system

is. Understand the importance of MIS

Understand the contemporary approaches of MIS

Explain the resources which implied in information system


Understand the career path of IT

### 1.2 INTRODUCTION

MIS provides several benefits to the business organization: the means of effective and efficient coordination between Departments; quick and reliable referencing; access to relevant data and documents; use of less labor; improvement in organizational and departmental techniques; management of day-to-day activities (as accounts, stock control, payroll, etc.); day-to-day assistance in a Department and closer contact with the rest of the world.

MIS provides a valuable time-saving benefit to the workforce. Employees do not have to collect data manually for filing and analysis. Instead, that information can be entered quickly and easily into a computer program. As the amount of raw data grows too large for employees to analyze, business analysts can build programs to access the data and information in response to queries by management. With faster access to needed information, managers can make better decisions

about procedures, future directions, and developments by competitors, and make them more quickly. We are living in a time of great change and working in an Information Age. Managers have to assimilate masses of *data*, convert that data into *information*, form conclusions about that information and *make decisions* leading to the achievement of business *objectives*. For an organization, information is as important resource as money, machinery and manpower. It is essential for the survival of the enterprise.



**Reflective activity**

Why is the study of management information system important to you?

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What do you hope to learn from this course to make it worthwhile?-----

### 1.3 Definition and Importance of MIS

#### 1.3.1 Definition of MIS

**Management Information System (MIS)** is basically concerned with the process of collecting, processing, storing and transmitting relevant information to support the management operations in any organizations. MIS is kind of organizational information computer systems, which take internal information from operating processing system and summaries them to meaningful and useful forms as management reports to use in performing management duties. MIS is one of the major computer-based information systems. Its purpose is to meet the general information need of all the managers in the firm or in some organizational subunit of the firm.

MIS is a collection of people, tools, procedures and software to perform various business tasks at various levels in the organization. MIS is a computer-based information system that provides for management-oriented reporting based on transaction processing and business operations of the organization. To the managers, MIS is an implementation of the organizational systems and procedures. To a programmer it is nothing but file structures and file processing. However, it involves much more complexity. The three components of MIS provide a more complete and

focused definition, where **System** suggests integration and holistic view, **Information** stands for processed data, and **Management** is the ultimate user, the decision makers.

### 1.3.2 Importance of MIS

It goes without saying that all managerial functions are performed through decision-making; for taking rational decision, timely and reliable information is essential and is procured through a logical and well-structured method of information collecting, processing and disseminating to decision makers. Such a method in the field of management is widely known as MIS.

In today's world of ever-increasing complexities of business as well as business organization, in order to service and grow, must have a properly planned, analyzed, designed and maintained MIS so that it provides timely, reliable and useful information to enable the management to take speedy and rational decisions.

MIS has assumed all the more important role in today's environment because a manager has to take decisions under two main challenges:

*First, because of the liberalization and globalization*, in which organizations are required to compete not locally but globally, a manager has to take quick decisions, otherwise his business will be taken away by his competitors. This has further enhanced the necessity for such a system.

*Second, in this information age* wherein information is doubling up every two or three years, a manager has to process a large voluminous data; failing which he may end up taking a strong decision that may prove to be very costly to the company.

In other words, organizations today just cannot survive and grow without properly planned, designed, implemented and maintained MIS. Having this in mind, the following are the most important **reasons** to have a good management information system:

**To control the creation and growth of records:** Despite decades of using various non-paper storage media, the amount of paper in our offices continues to escalate. An effective records information system addresses both creation control (limits the generation of records or copies not required to operate the business) and records retention (a system for destroying useless records or retiring inactive records), thus stabilizing the growth of records in all formats.

**To reduce operating costs:** Recordkeeping requires administrative Birr for filing equipment, space in offices, and staffing to maintain an organized filing system (or to search for lost records

when there is no organized system).It costs considerably less per linear foot of records to store inactive records in a Data Records Center versus in the office.

**To improve efficiency and productivity:** Time spent searching for missing or misfiled record is non-productive. A good records management program (e.g. a document system) can help any organization upgrade its recordkeeping systems so that information retrieval is enhanced, with corresponding improvements in office efficiency and productivity. A well designed and operated filing system with an effective index can facilitate retrieval and deliver information to users as quickly as they need it. Moreover, a well-managed information system acting as a corporate asset enables organizations to objectively evaluate their use of information and accurately lay out a roadmap for improvements that optimize business returns.

**To assimilate new records management technologies:** A good records management program provides an organization with the capability to assimilate new technologies and take advantage of their many benefits. Investments in new computer systems whether this is financial, business or otherwise, don't solve filing problems unless current manual recordkeeping or bookkeeping systems are analyzed (and occasionally, overhauled) before automation is applied.

**To ensure regulatory compliance:** In terms of recordkeeping requirements, China is a heavily regulated country. These laws can create major compliance problems for businesses and government agencies since they can be difficult to locate, interpret and apply. The only way an organization can be reasonably sure that it is in full compliance with laws and regulations is by operating a good management information system which takes responsibility for regulatory compliance, while working closely with the local authorities. Failure to comply with laws and regulations could result in severe fines, penalties or other legal consequences.

**To minimize litigation risks:** Business organizations implement management information systems and programs in order to reduce the risks associated with litigation and potential penalties. This can be equally true in Government agencies. For example, a consistently applied records management program can reduce the liabilities associated with document disposal by providing for their systematic, routine disposal in the normal course of business.

**To safeguard vital information:** Every organization, public or private, needs a comprehensive program for protecting its vital records and information from catastrophe or disaster, because every organization is vulnerable to loss. Operated as part of a good management information 4

system, vital records programs preserve the integrity and confidentiality of the most important records and safeguard the vital information assets according to a "Plan" to protect the records. This is especially the case for financial information whereby ERP (Enterprise Resource Planning) systems are being deployed in large companies.

**To support better management decision making:** In today's business environment, the manager that has the relevant data first often wins, either by making the decision ahead of the competition, or by making a better, more informed decision. A good MIS can help ensure that managers and executives have the information they need when they need it. By implementing an enterprise-wide file organization, including indexing and retrieval capability, managers can obtain and assemble pertinent information quickly for current decisions and future business planning purposes.

**To preserve the corporate memory:** An organization's files, records and financial data contain its institutional memory, an irreplaceable asset that is often overlooked. Every business day, you create the records, which could become background data for future management decisions and planning.

**To foster professionalism in running the business:** A business office with files, documents and financial data, stacked on top of file cabinets and in boxes everywhere, creates a poor working environment. The perceptions of customers and the public, and "image" and "morale" of the staff, though hard to quantify in cost-benefit terms, may be among the best reasons to establish a MIS.

### **1.3 Subsystems Of MIS**

#### **What Is a System?**

A **system** is an array of components that work together to achieve a common goal, or multiple goals, by accepting input, processing it, and producing output in an organized manner. Consider the following examples: A sound system, organizations, consist of components—people organized into departments and divisions which work together to achieve common goals.

#### **Components of a system**



**Figure 1:** Components of a System

**Inputs:** Inputs are the elements (materials, human resources, and information) that enter in the system for processing to produce output in much the same way as that a business uses human, financial and material resources to produce goods and services.

**Processor:** processors are the element of the system which involves in the actual transformation of input in to output. It is the operational component of a system. Processors may modify the input totally or partially, depending on the specifications of the output.

**Control:** The control element guides the system. It is a decision-making subsystem that controls the pattern of activities governing input, processing, and output.

**Feedback:** Control in a dynamic system is achieved by feedback. In feedback the output is measured against standard, in some form of cybernetics procedures that include communication and control. Feedback may be positive or negative routine or informational. Positive feedback reinforces the performance of the system. It is routine in nature. Negative feedback generally provides the controller with information for action.

**Environment:** Environment is the supra-system which operates with in an organization. It is the source of external elements that impinge on the system. In fact, it determines how a system must function. It may can be classified into two internal environment and external environment.

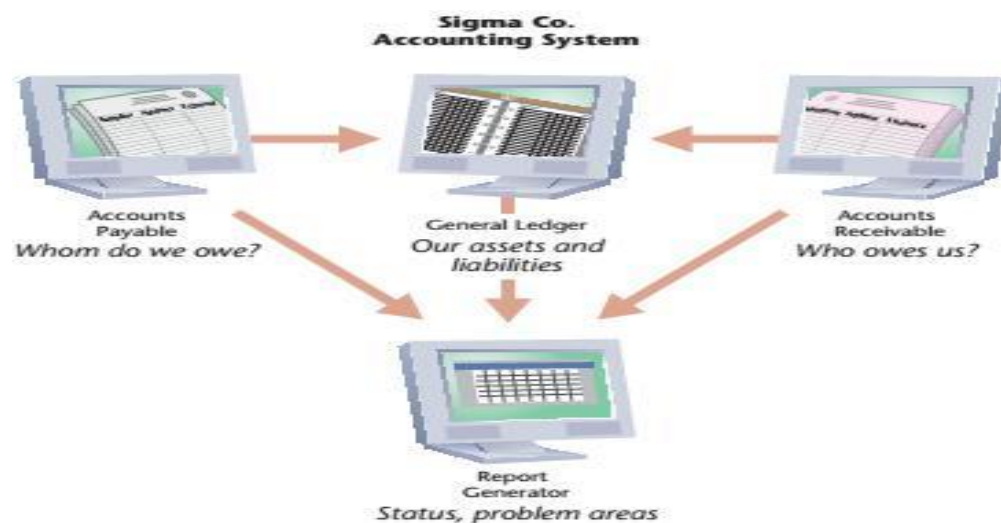
### 1.3.1 Systems and Subsystems

Not every system has a single goal. Often, a system consists of several **subsystems** components of a larger system with sub goals, all contributing to meeting the main goal. Subsystems can receive input from, and transfer output to other systems or subsystems.

Consider the different departments of a manufacturing business. The *marketing* department promotes sales of the organization's products; the *engineering* department designs new products and improves existing ones; the *finance* department plans a budget and arranges for every

unused penny to earn interest by the end of the day. Each department is a subsystem with its own goal, which is a sub goal of a larger system (the company), whose goal is to maximize profit.

Now consider the goals of a manufacturing organization's information system, which stores and processes operational data and produces information about all aspects of company operations. The purpose of its inventory control subsystem is to let managers know what quantities of which items are on hand and which may soon have to be reordered. The purpose of the production control subsystem is to track the status of manufactured parts. The assembly control subsystem presents the bill of material (a list of all parts that make up a product) and the status of assembled products. The entire system's goal is to help deliver finished goods at the lowest possible cost within the shortest possible time.



**Figure 2: Several subsystems make up this corporate accounting system.**

### 1.3.2 Closed vs. Open Systems

Systems can be classified into two which are closed or open, depending on the nature of the information flow in the system.

A **closed system** stands alone, with no connection to another system: nothing flows in from another system, nothing flows out to another system. For example, a small check-producing system that prints and cuts checks when an employee enters data through a keyboard is a closed system. The system might be isolated for security purposes.

An **open system** interfaces and interacts with other systems. For example, an accounting system that records accounts receivable, accounts payable, and cash flow is open if it receives its payroll figures from the payroll system. **Subsystems**, by definition, are always open, because as components of a bigger system, they must receive information from, and give information to, other subsystems. Increasingly, companies are implementing open—interfaced—information systems.

Each system may then be referred to as a module of a larger system, and the modules are interconnected and exchange data and information. For better cooperation, many organizations have interconnected their information systems to those of their business partners, mainly suppliers and clients.



### Reflective activity

sometimes customers of the specific divisions have been saying “the system is not working” and also some of them have been saying “the formal system is not working”

- a. What does it mean “the system is not working” and “the informal system is better than the formal one”, answer this as a management professionals?-----

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-----.

## 1.4 Contemporary Approaches To MIS

Multiple perspectives on information systems show that the study of it is a multidisciplinary field. No single theory or perspective dominates. The major disciplines that contribute problems, issues, and solutions in the study of information systems. In general, the field can be divided into **technical** and **behavioral approaches** as well as sociotechnical systems. Though they are composed of machines, devices, and “hard” physical technology, they require substantial social, organizational, and intellectual investments to make them work properly.

### A. Technical Approach

The technical approach to IS emphasizes mathematically based models to study information systems, as well as the physical technology and formal capabilities of these systems. The disciplines that contribute to the technical approach are computer science, management science, and operations research.

*Computer science* is concerned with establishing theories of computability, methods of computation, and methods of efficient data storage and access. *Management science* emphasizes the development of models for decision-making and management practices. *Operations research* focuses on mathematical techniques for optimizing selected parameters of organizations, such as transportation, inventory control, and transaction costs.

## **B. Behavioral Approach**

An important part of the MIS field is concerned with behavioral issues that arise in the development and long-term maintenance of information systems. Issues such as strategic business integration, design, implementation, utilization, and management cannot be explored usefully with the models used in the technical approach. Other behavioral disciplines contribute important concepts and methods.

For instance, *sociologists* study information systems with an eye toward how groups and organizations shape the development of systems and also how systems affect individuals, groups, and organizations. *Psychologists* study information systems with an interest in how human decision makers perceive and use formal information. *Economists* study information systems with an interest in understanding the production of digital goods, the dynamics of digital markets, and how new information systems change the control and cost structures within the firm.

The behavioral approach does not ignore technology. Indeed, information systems technology is often the stimulus for a behavioral problem or issue. But the focus of this approach is generally not on technical solutions. Instead, it concentrates on changes in attitudes, management and organizational policy, and behavior.



**Figure 3: Contemporary approaches to information systems**

### **C. Sociotechnical Systems**

Four main actors: suppliers of hardware and software (the technologists); business firms making investments and seeking to obtain value from the technology; managers and employees seeking to achieve business value (and other goals); and the contemporary legal, social, and cultural context (the firm's environment). Together these actors produce what we call *management information systems*.

The study of management information systems (MIS) arose to focus on the use of computer-based information systems in business firms and government agencies. MIS combines the work of computer science, management science, and operations research with a practical orientation toward developing system solutions to real-world problems and managing information technology resources. It is also concerned with behavioral issues surrounding the development, use, and impact of information systems, which are typically discussed in the fields of sociology, economics, and psychology.

**Sociotechnical view** of systems optimal organizational performance is achieved by jointly optimizing both the social and technical systems used in production.

Adopting a sociotechnical systems perspective helps to avoid a purely technological approach to information systems. For instance, the fact that information technology is rapidly declining in cost and growing in power does not necessarily or easily translate into productivity enhancement or bottom-line profits.

Both the technical and behavioral components need attention. This means that technology must be changed and designed in such a way as to fit organizational and individual needs. Sometimes, the technology may have to be “de-optimized” to accomplish this fit. For instance, mobile phone users adapt this technology to their personal needs, and as a result manufacturer quickly seek to adjust the technology to conform with user expectations. Organizations and individuals must also be changed through training, learning, and planned organizational change to allow the technology to operate and prosper.



### Reflective activity

Why information system recommended to consider both technical and behavioral issues? Why not only technical? Why not only behavioral? -----  
-----

## 1.5 The Evolution and Characteristics of The Information Age

### Evolution of the Information Age

*Agricultural Age:* The period up to the 1800s, when the majority of workers were farmers whose lives revolved around agriculture.

*Industrial Age:* The period from the 1800s to 1957, when work processes were simplified through mechanization and automation.

*Information Age:* The period that began in 1957, in which the majority of workers are involved in the creation, distribution, and application of information.

*Knowledge Workers:* Workers involved in the creation, distribution, and application of information.

The **Information Age** (also known as the **Computer Age**, **Digital Age**, or **New Media Age**) is a period in human history characterized by the shift from traditional industry that the Industrial Revolution brought through industrialization, to an economy based on information computerization. The onset of the Information Age is associated with the Digital Revolution, just as the Industrial Revolution marked the onset of the Industrial Age.

During the information age, the phenomenon is that the digital industry creates a knowledge-based society surrounded by a high-tech global economy that spans over its influence on how the manufacturing throughput and the service sector operate in an efficient and convenient way. In a commercialized society, the information industry is able to allow individuals to explore their personalized needs, therefore simplifying the procedure of making decisions for transactions and significantly lowering costs for both the producers and buyers. This is accepted overwhelmingly by participants throughout the entire economic activities for efficacy purposes, and new economic incentives would then be indigenously encouraged, such as the knowledge economy. The Information Age formed by capitalizing on computer microminiaturization advances. This evolution of technology in daily life and social organization has led to the fact that the modernization of information and communication processes has become the driving force of social evolution.

### **1.5.1 Characteristics of the Information Age**

The Information Age is a concept that characterizes the current age by the ability of individuals to transfer information freely and have instant access to information that would have been difficult or impossible to access in the past. The idea is linked to the concept of a digital age or digital revolution, as most of this information is instantaneously available online. It carries with it the ramifications of a shift from an industrialized economy to an economy based on the manipulation of information, or an information society.

Work processes are being transformed to increase productivity.

***Work Processes:*** The combination of activities that workers perform, the way they perform those activities, and the tools they use.

***Productivity:*** The relationship between the results of an activity (output) and the resources used to create those results (inputs).

***Effectiveness:*** The extent to which desirable results are achieved.

**IT (information technology)** provides the means to rethink/recreate/reengineer conventional business processes.

**Reengineering:** The reshaping of business processes to remove barriers that prohibit an organization from providing better products and services and to help the organization capitalize on its strengths.

**Business Processes:** Collections of activities, often spanning several departments that take one or more kinds of input and create a result that is of value to a company's customers.

Success in business is largely determined by the effectiveness with which IT is used. IT is embedded in many products and services.

Reengineering efforts to attain greater productivity:

**Industrial Age-** Division of Labor: Separation of work process into component task, with different workers specializing in each of the tasks.

**Information Age-** Teamwork, Interconnection, and Shared Information.

## 1.6 Information Technology?

Information technology (IT) refers to hardware, software, databases, and telecommunications. A business's **technology infrastructure** includes all the hardware, software, databases, telecommunications, people, and procedures that are configured to collect, manipulate, store, and process data into information. The technology infrastructure is a set of shared IS resources that form the foundation of each computer-based information system.

**Hardware:** consists of the physical components of a computer that perform the input, processing, storage, and output activities of the computer. Input devices include keyboards, mice, and other pointing devices; automatic scanning devices; and equipment that can read magnetic ink characters. Processing devices include computer chips that contain the central processing unit and main memory. Advances in chip design allow faster speeds, less power consumption, and larger storage capacity. Some specialized computer chips will be able to monitor power consumption for companies and homeowners.

Companies make small, portable chips that are used to conveniently store programs, data files, and more. Processor speed is also important. Today's computers are more advanced processor chips they have than the power of 1990s-era supercomputers that occupied a large room. Small,

inexpensive computers and handheld devices are also popular. Inexpensive netbooks are small, inexpensive laptop computers and be used primarily to connect to the internet.

**Software:** it consists of the computer programs that govern the operation of the computer. These programs allow a computer to process payroll, send bills to customers, and provide managers with information to increase profits, reduce costs, and provide better customer service. The two types of software are **system software** and **applications software**, which allows to accomplish specific tasks, including word processing or tabulating numbers. Software is needed for computers of all sizes, from small handheld computers to large supercomputers.

**Database:** is an organized collection of facts and information, typically consisting of two or more related data files. An organization's database can contain information on customers, employees, inventory, competitors' sales, online purchases, and much more. Most managers and executives consider a database to be one of the most valuable parts of a computer-based information system. Increasingly, organizations are placing important databases on the internet, which makes them accessible to many, including unauthorized users.

**Telecommunication:** is the electronic transmission of signals for communications, which enables organizations to carry out their processes and tasks through computer networks. Large restaurant chains, for example, can use telecommunications systems and satellites to link hundreds of restaurants to plants and headquarters to speed credit card authorization and report sales and payroll data.

**Networks:** connect computers and equipment in a building, around the country, or around the world to enable electronic communication. Investment firms can use wireless networks to connect thousands of investors with brokers or traders. Many hotels use wireless telecommunications to allow guests to connect to the internet, retrieve voice messages, and exchange email without plugging their computers or mobile devices into a phone jack. With telecommunications, people can work at home or while traveling. This approach to work, often called telecommuting, allows a telecommuter living in England to send his or her work to the United States, China, or any location with telecommunications capabilities.

**Internet** is the world's largest computer network, consisting of thousands of interconnected networks, all freely exchanging information. Research firms, colleges, universities, high schools, hospitals, and businesses are just a few examples of organizations using the internet.

Increasingly, businesses and people are using the internet to run and deliver important applications, such as accessing vast databases, performing sophisticated business analysis, and getting a variety of reports. This concept, called **cloud computing**, which allows people to get the information they need from the internet (the cloud) instead of from desktop or corporate computers. The World Wide Web (WWW), or web, is a network of links on the internet to documents containing text, graphics, video, and sound. Information about the documents and access to them are controlled and provided by tens of thousands of special computers called web servers. The web is one of many services available over the internet and provides access to many hundreds of millions of documents.

The technology used to create the internet is also being applied within companies and organizations to create **intranets**, which allow people within an organization to exchange information and work on projects.

An **extranet** is a network based on web technologies that allows selected outsiders, such as business partners and customers, to access authorized resources of a company's intranet. Companies can move all or most of their business activities to an extranet site for corporate customers. Many people use extranets every day without realizing it – to track shipped goods, order products from their suppliers, or access customer assistance from other companies.

**People:** People are the most important element in most CBIS (computer-based information system). The people involved include users of the system and IS personnel, including all the people who manage, run, program, and maintain the system.

**Procedures:** it includes the strategies, policies, methods, and rules for using the CBIS, including the operation, maintenance, and security of the computer. For example, some procedures describe when each program should be run. Others describe who can access facts in the database. Good procedures can help companies take advantage of new opportunities and avoid potential disasters.

## **Chapter Summery**

Management information system is a collection of hardware, software, data, people and telecommunications networks that interact with one another to capture, process, store, and disseminate information in an organization.

MIS is kind of organizational information computer systems, which take internal information from operating processing system and summaries them to meaningful and useful forms as management reports to use in performing management duties.

MIS has assumed all the more important role in today's environment because a manager has to take decisions under two main challenges: *First, because of the liberalization and globalization*, in which organizations are required to compete not locally but globally, a manager has to take quick decisions, otherwise his business will be taken away by his competitors. *Second, in this*

*information age* wherein information is doubling up every two or three years, a manager has to process a large voluminous data.

A system is an array of components that work together to achieve a common goal, or multiple goals, by accepting input, processing it, and producing output in an organized manner.

**Subsystems** is components of a larger system with sub goals, all contributing to meeting the main goal.

**Sociotechnical view** of systems optimal organizational performance is achieved by jointly optimizing both the social and technical systems used in production. This means that technology must be changed and designed in such a way as to fit organizational and individual needs.

The **Information Age** (also known as the **Computer Age**, **Digital Age**, or **New Media Age**) is a period in human history characterized by the shift from traditional industry that the Industrial Revolution brought through industrialization, to an economy based on information computerization.

Information technology (IT) refers to hardware, software, databases, and telecommunications. A business's **technology infrastructure** includes all the hardware, software, databases, telecommunications, people, and procedures that are configured to collect, manipulate, store, and process data into information.

## Exercise questions

1. It is possible to run the computer without a system software. True or false
2. Which of the following IS resources that form the foundation of each computer-based information system?  
A. Hardware    b. Software    c. People    d. Telecommunication    e. All
3. Is not a component parts of a system  
a. Input    b. Output    c. Feedback    d. Environment    e. None

4. Computer programs that govern the operation of a computer system are called \_\_\_\_\_.  
a. feedback b. feedforward c. software d. transaction processing systems
5. A measure of what is produced divided by what is consumed is known as \_\_\_\_\_.  
a. efficiency      b. effectiveness      c. performance      d. productivity
6. People who spend most of their working day creating, using, and distributing information are  
A. industrial workers B. agrarian worker C. factory worker D. knowledge worker E. A and C F. all
7. Describe how information systems are used at school or work?-----  
-----  
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8. What is the value of software with example? -----  
-----  
-----.
9. Discuss how information systems are linked to the business objectives of an organization?-----  
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## CHAPTER TWO

### 2. FOUNDATIONAL CONCEPTS IN MIS

#### 2.1 Chapter Objective

Dear learner, welcome to the second chapter of management information system! In this chapter of the module, you will learn the basic concepts in MIS such as data, information, knowledge, wisdom, framework of IS, business system and e- business. Hence, this chapter also contains with major concepts you have to eager and Enjoy reading each section with curiosity.

Dear learner After studying this chapter, you have capable to did the following:

Understand business and management functions

Understand the meaning and differences of Data, Information, Knowledge and

Wisdom. Understand the importance of MIS

Understand the need for information and sources

Understand A Framework for Information Systems

Know what is business system and e-business

## **2.2 Introduction**

IS and technologies are vital components of successful businesses and organizations. Thus, constitute an essential field of study in business administration and management, which is why most business majors include a course in Information technologies, including Internet-based IS, are playing vital and expanding roles in business. IT can help all kinds of businesses improve the efficiency and effectiveness of their business processes, managerial decision making, and workgroup collaboration, which strengthens their competitive positions in rapidly changing marketplaces. This benefit occurs irrespective of whether the IT is used to support product development teams, customer support processes, e-commerce transactions, or any other business activity. *IT and IS are, quite simply, an essential ingredient for business success in today's dynamic global environment.*

Therefore, it is a computer-based system that provides information for decisions making on planning, organizing and controlling the operation of the sub-system of the firm and provides a synergistic organization in the process.

The lifespan of most product has continued getting shorter and shorter and therefore the challenge to the manager is to design product that will take a longer shelf life and in order to do this, the manager must be able to keep abreast of the factors that influences the organization product and services thus, MIS come in handy in supporting the process.

Information is the life blood of an organization, particularly in the case of system approach management. The MIS or IS can be defined as the knowledge communicated by others or obtained from investigation or study. It is a system providing needed information to each manager at the right time in the right form and relevant one which aid understanding and stimulates the action.

MIS is an organized method of providing past, present and projection information relating to internal operations and external intelligence. It supports the planning, control and operational functions of an organization by furnishing uniform information in proper time frame to help the process of decision-making.

### **2.3 The Real World of Information Systems**

A system is a set of interrelated components, with a clearly defined boundary, working together to achieve a common set of objectives. Using this definition, it becomes easy to see that virtually everything you can think of is a system, and one system can be made up of other systems or be part of a bigger system.

An **information system** (IS) can be any organized combination of people, hardware, software, communications networks, data resources, and policies and procedures that stores, retrieves, transforms, and disseminates information in an organization.

Consider some of the following examples of information systems:

**Smoke signals for communication** were used as early as recorded history and can account for the human discovery of fire. The pattern of smoke transmitted valuable information to others who were too far to see or hear the sender.

**Card catalogs in a library** are designed to store data about the books in an organized manner that allows readers to locate a particular book by its title, author name, subject, or a variety of other approaches.

**Your book bag, day planner, notebooks, and file folders** are all part of an IS designed to help you organize the inputs provided to you via handouts, lectures, presentations, and discussions. They also help you process these inputs into useful outputs: homework and good exam grades.

**The cash register** is part of a large IS that tracks the products sold, the time of a sale, inventory levels, and the amount of money in the cash drawer; it also contributes to the analysis of product sales in any combination of locations anywhere in the world.

**A paper-based accounting ledger** as used before the advent of computer-based accounting systems is an iconic example of an IS. Businesses used this type of system for

centuries to record the daily transactions and to keep a record of the balances in their various business and customer accounts.

### 2.3.1 The Stages of Information Processing

All IS operating in the same basic fashion whether they include a computer or not. However, the computer provides a convenient means to execute the main operations of an IS:

Entering data into the IS (**input**).

Changing and manipulating the data in the IS (**data processing**). Getting information out of the IS (**output**).

Storing data and information (**storage**).

**Input:** The first step in producing information is collecting and introducing data, known as input, into the IS. It is the activity of gathering and capturing data. Most data an organization uses as input to its ISs are generated and collected within the organization. These data elements result from transactions undertaken in the course of doing business. A **transaction** is a business event: a sale, a purchase, a payment, the hiring of a new employee, and the like. These transactions can be recorded on paper and later entered into a computer system; directly recorded through terminals of a **transaction processing system (TPS)**, such as a point-of-sale (POS) machine; or captured online when someone transacts through the Web. A TPS is any system that records transactions. Often, the same system also processes the transactions, summarizing and routing information to other systems.

**Processing:** means converting or transforming this input into useful outputs. Processing can involve making calculations, comparing data and taking alternative actions, and storing data for future use. In a payroll application, the number of hours each employee worked must be converted into net, or take-home, pay. Other inputs often include employee ID number and department. The required processing can first involve multiplying the number of hours worked by the employee's hourly pay rate to get gross pay.

Computer's greatest contribution to ISs is efficient data processing. The computer's speed and accuracy enable organizations to process millions of pieces of data in a few seconds. **For example**, managers of a national retail chain can receive up-to-date information on inventory levels of every item the chain carries and then order accordingly; in the past, obtaining such information would take days.

**Output:** involves producing useful information, usually in the form of documents and reports and displays in the format most useful to an organization. Outputs can include pay check for employees, reports for managers, and information supplied to stockholders, banks, government agencies, and other groups. As we have already said, output from one system can become input for another. For example, output from a system that processes sales orders can be used as input to a customer billing system. Computers typically produce output on printers and display screens. Output can also be handwritten or manually produced reports and documents.

In the computer based IS the most widely used output device is the video display, or video monitor, which displays output visually. Another common output device is the printer, used to print hard copies of information on paper. However, computers can communicate output through speakers in the form of music or speech and also can transmit it to another computer or electronic device in computer-coded form, for later interpretation.

**Storage:** is a part of IS which help as a means of retaining what the system wants to hold and retrieve important organizational matters. One of the greatest benefits of using IT is the ability to store vast amounts of data and information. Technically, storing a library of millions of volumes on magnetic or optical storage media is feasible. Publishers, libraries, and governments have done that.

Lastly, **feedback** is information from the system that is used to make changes to input or processing activities. For example, errors or problems might make it necessary to correct input data or change a process. **Feedback** is also important for managers and decision makers. **For example**, a furniture maker could use a computerized feedback system to link its suppliers and plants. The output from an IS might indicate that inventory levels for material ‘A’ and ‘B’ are getting low – a potential problem. A manager could use this feedback to decide to order the products from their suppliers. These new inventory orders then become input to the system.

A computer system can also be proactive – predicting future events to avoid problems. This concept, often called **forecasting**, can be used to estimate future sales and order more inventory before a shortage occurs. Forecasting is also used to predict the strength of hurricanes and possible landing sites, future stock market values, and who will win a political election.

### 2.3.2 Components of Information Systems

To support the data processing functions, different types of technologies are used.

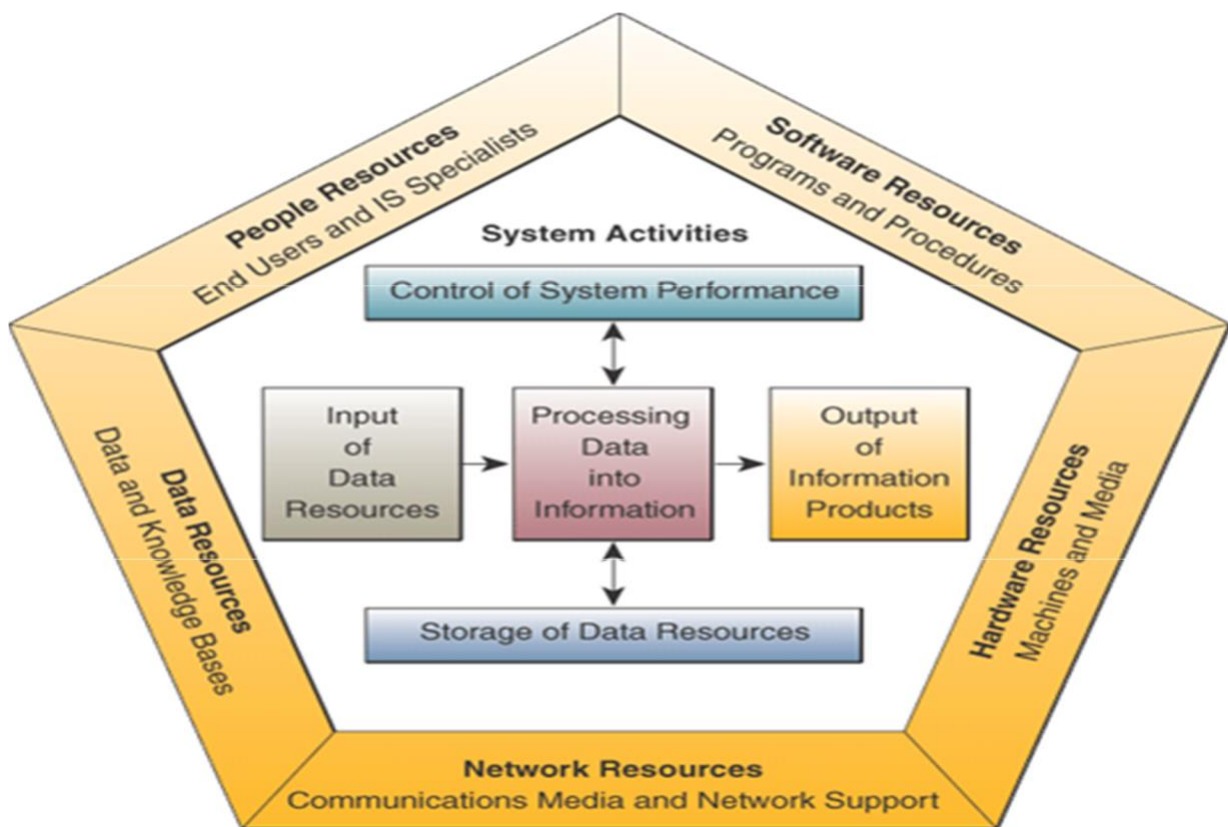
Input devices introduce data into the IS.

The computer processes data through the IS.

Output devices display information.

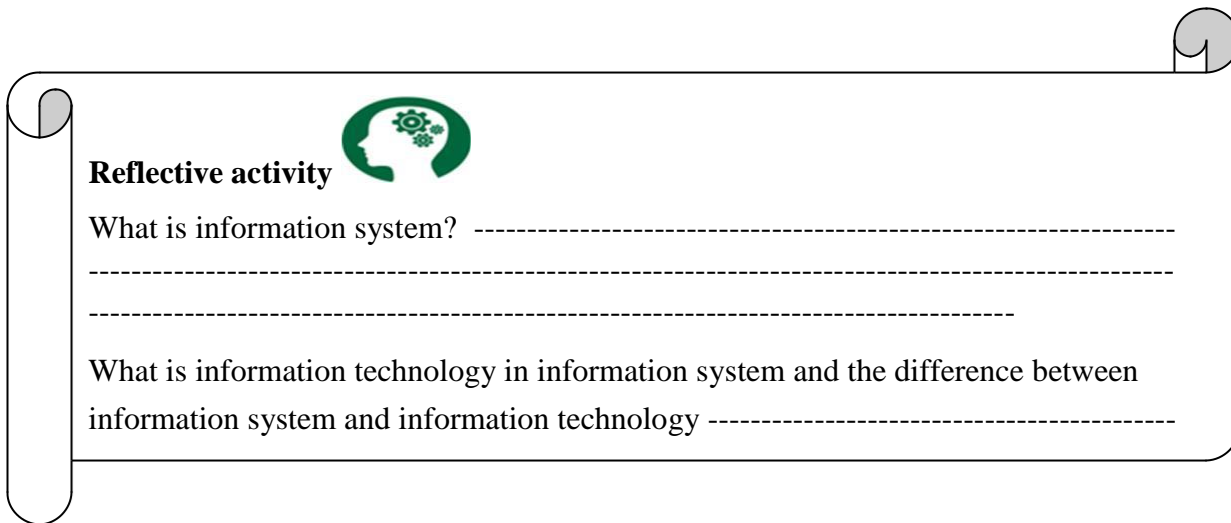
Storage devices store data and information


Networking devices and communications lines transfer data & information over various distances.



**Figure 2.1:** The five basic components of the computer system within an IS

In addition to communication that takes place between computer components, communication occurs between computers over great distances (called **telecommunications**). Communications technology lets users access data and other electronic resources of many computers, all connected in a network. This way, the capabilities of a single computer might be augmented with the power of an entire network.



**Reflective activity** 

What is information system? -----  
-----  
-----

What is information technology in information system and the difference between information system and information technology -----

## **2.4 Data, Information, Knowledge and Wisdom**

Data is not information, information is not knowledge, and knowledge is not wisdom. They are similar but not the same. However, what you can say about them is they are each necessary component to a working system, and they are the things that must be integrated for a system to function. Data must be extracted, sorted, and analyzed to become information. Information must be studied, organized, and learned to become knowledge. Knowledge must be put into action and be experienced to become wisdom. Wisdom leads to the discovery new or amended data. And the process goes on and on... These components work together to establish and refine a system. If we look at emergency management and planning as a system, we can use these concepts as a road map towards developing and standardizing plans and responses globally.

### **2.4.1 Data**

According to business dictionary, data is the discrete elements like names, words, alphabets, numbers, and symbols that refer to, represent, conditions, ideas, objects. If you did not make further process this you have the data but you still don't have the information about

something. Let's look at data as the simplest pieces of the records; the individual actions required to get it to work.

## **2.4.2 Information**

Information is one of those concepts that we all seem intuitively able to grasp, but find it tricky to define. "Information is that which reduces uncertainty." Imagine you wake up one morning unsure of the weather. When you open the curtains you see the sun shining so you know a bit more about what's it's going to be like today. Your uncertainty about the weather has just been reduced: therefore, looking out of the window gave you information. When you turn on your radio and hear the weather report, your uncertainty has been reduced further. When you look at the temperature gauge in your car, your uncertainty has gone down again.

Information consists of taking the steps (data), and ensuring that they are placed within the plan in a working and logical order that makes the plan flow. This is where planners need to "walk the plan," or physically go through the process described within them.

So, information is a collection of facts. These facts can take many forms. The temperature gauge in the car gives information in the form of a number. The radio gives audio information. Looking out of the window gives visual information. Other forms include text, images, and video clips.

### **2.4.2.1 The Characteristics of Valuable Information**

To be valuable to managers and decision makers, information should have some and possibly all of the characteristics described in below.

***Information quality:*** Information that is outdated, inaccurate, or hard to understand would not be very meaningful, useful, or valuable to you or other end users. People want information of high quality, that is, information products whose characteristics, attributes, or qualities make the information more valuable to them.

It is useful to think information as having the three dimensions of time, content, and form.

#### ***Time dimension***

Timeliness – information should be provided when it is needed

Accuracy – information should be up to date when it is provided

Frequency – information should be provided as often as needed

Time period- information can be provided about past, present or future time periods

### ***Content dimension***

Accuracy – information should be free from errors

Relevancy – information should be related to the information needs of the specific recipient for the specific situation

Completeness – all information that is needed should be provided

Conciseness – only the information that is needed should be provided

Scope – an information can have a broad or narrow scope an internal or external focus

Performance – information can reveal performance by measuring activities accomplished, progress made, or resources accumulated

### ***Form dimension***

Clarity – information should be provided in a form that is easy to

understand Detail – information can be provided in detail or summary form

Order – information can be arranged in a predetermined sequence

Presentation – information can be presented in narrative, numeric, graphic or other forms.

Media – information can be provided in the form of printed paper documents, video displays, or other media.

### **Data Vs Information**

The terms Data and Information closely related to each other. A philosopher might define data as variation. A blank page contains no data, but as soon as there is a mark on the page – in other words as soon as there is a variation in the blankness – then data exist. The traditional information systems view is that as soon as we assign meaning to the mark on the page, the data has turned into information.

### **2.4.3 Knowledge**

It is the organized information into chapters, conceptual frameworks or facts. Knowledge is derived from information in the same way information is derived from data; it is a person's range

of information. Knowledge represents a pattern that connects and generally provides a high level of predictability as to what is described or what will happen next. *Ex: If the humidity is very high and the temperature drops substantially the atmosphere is often unlikely to be able to hold the moisture so it rains.*

#### **2.4.4 Wisdom**

Applying knowledge into books, systems, beliefs, traditions, philosophies, principles and truths – like my personal belief system to stop long searches for information. The Merriam-Webster dictionary defines wisdom as “knowledge that is gained by having experience in life.” In other words, wisdom is turning knowledge into “muscle memory;” the transfer of knowledge from the short term to the long-term memory. Wisdom embodies more of an understanding of fundamental principles embodied within the knowledge that are essentially the basis for the knowledge being what it is. Wisdom is essentially systemic.

*Ex: It rains because it rains. And this encompasses an understanding of all the interactions that happen between raining, evaporation, air currents, temperature gradients, changes, and raining.*



**Figure 2.2:** The Data-Information-Knowledge-Wisdom hierarchy as a pyramid

### **2.5 Business Functions and Management Functions**

Small business owners often make the mistake of creating jobs for the people they have, rather than putting employees into positions the business needs. To properly staff and run your business,

create an organization chart that includes the primary business functions any company must have to maximize its success. You can call these functional departments business by different names

and combine them, but your organization should include sales, administration, marketing, finance, operations, human resources and IT, or information technology.

- 2 Administration:** The administration function of a business is a macro function that oversees all other functions. The administrative staff usually includes the CEO or president, COO -- chief operating officer -- and secretarial staff. This is the function through which corporate policies are made and communicated. The administrative staff oversees tasks that relate to the company, but not any specific department, such as negotiating and paying rent, ordering office supplies and handling business licenses, permits and zoning. Depending on the size of the business and amount of customer care needed, the administrative staff might manage customer service, too.
- 3 Sales and Marketing:** Sales and marketing are often combined, although they are very different functions. Your marketing department determines what type of product or service you'll offer, sets your pricing strategy, creates your brand, determines where you'll sell your product and creates and executes your advertising, public relations and promotions campaigns. A sales department sells your product or service. Sales personnel work hand in hand with the marketing department to provide vital information on customer needs, competition and market trends. At smaller companies, sales representatives service and support their customers after the sale. Because of its involvement with product development, the marketing department handles research and development at small businesses, often working with the administrative executives who are founders or experts in the industry or profession.
- 4 Finance and Human Resources:** Many small businesses combine their finance and human resources departments. Bookkeeping might not require a staff member's full time, allowing that person to handle employee hiring, benefits management, corporate policies and other employee-related tasks.
- 5 Information Technology:** Even small businesses need a dedicated IT person these days, based on the amount of technology in today's offices. This person must be able to network the company's computers, keep them running and safe and ensure employee email functions smoothly. The IT function might include maintenance of the company's website and phone system. Many small businesses combine administrative and IT functions, hiring a part-time IT manager.

- 6 Operations and Manufacturing:** Depending on your product or service, you might need a manufacturing or operations department. This function oversees the physical plant of a manufacturing facility and its materials needs, work schedule and production processes. At a restaurant, this function might be the kitchen, managed by the executive chef. At some small companies, the administrative executives take the role of the operations team.

## **2.6 Functions of Management**

Management functions represent the activities that managers should perform to achieve organizational goals. In simple words, management functions are prescriptive in nature.

The various functions of management constitute a unified body and are commonly referred to as a process of management. Process of management is circular in nature, as functions are interrelated and performed one after the other.

- 1. Planning:** It refers to deciding goals and activities today to achieve them tomorrow. It is the first function of management, because all other functions depend on planning. Planning involves determining Vision (what the organization wants to be in future), Mission (a statement of values, principles, activities and Stakeholders), goals (qualitative and long-term), objectives (quantitative and short-term), Strategies (Growth/ Stability/ Retrenchment at the corporate level and cost leadership/differentiation or focus at the strategic business units' level), Tactics (a smaller-scale plan developed to implement a strategy), Operational plans like policies, programs, procedures, budgets, etc. For planning to be effective, it also requires analyzing environment, forecasting, decision making and formulation of plans.
- 2. Organizing:** It involves identifying (what tasks are to be done) and grouping of activities (how the tasks are to be grouped), dividing grouped activities into small jobs and tasks (who is to do them), determining authority-responsibility relationship (who reports to whom, determining degree of centralization (where decisions are to be made) and creating organizational structure to accomplish organizational attainments efficiently (doing this rightly with minimum of cost) and effectively (doing the right thing). Organizing also involves deciding about delegation of authority, span of management, centralization and decentralization of authority
- 3. Staffing:** To man the organization and to bring it into action, the staffing function undertakes manpower planning, recruitment, selection, performance appraisal, training, promotion, demotion, transfer, wage and salary administration and industrial relations.

4. **Directing:** Like a film director, a manager too has to direct the efforts of his subordinates. Directing includes the functions of leadership to influence the subordinates to work towards a common goal; motivation – to voluntarily bring out the best out of subordinates in the best interests of an organization; communication – by way of issuing orders and instructions, guiding, counseling and telling subordinates the right way to work and opening up of interactions and feedbacks; and supervising the work on a regular basis.
5. **Controlling:** It continuously involves setting the standards with which to measure the actual performance, measurement of ongoing performance, matching it with the standards, finding variations (causes of variations), and taking corrective action, if any. Control function is circular in nature, because these must be repeated until goals are achieved.

## **2.7 Information Needs of Managers and Information Sources of Managers**

### **2.7.1 Information Needs of Managers**

An international corporation needs information to coordinate and control its diverse businesses. Reporting and early-warning systems are very important in this environment. Systems that summarize sales data and process accounting information are necessary, but they only reflect what has happened in the past. These systems represent traditional uses of IT for reporting and control.

Technology offers the international firm many more active tools to help manage the business. Coordination is a major problem for the global firm. IT provides a number of approaches to improving communications and coordination, for example, e-mail and fax.

People require information for many reasons and in varied ways. For instance, you probably seek information for entertainment and enlightenment by viewing television, watching movies, browsing the Internet, listening to the radio, and reading newspapers, magazines, and books. In business, however, people and organizations seek and use information mainly to make sound decisions and to solve problems—two closely related practices that form the foundation of every successful company.

**A problem** is any undesirable situation. When you are stuck in the middle of nowhere with a flat tire, you have a problem. If you know that some customers do not pay their debts on time, but you don't know who or how much they owe, you have a problem. You can solve both problems with the aid of information. In the first case, you can call a towing company, which might use a

computerized tracking system to send the tow truck closest to your location; in the second case, simple accounting software can help.

An organization or individual that identifies more than one way to solve a problem or a dilemma must make a *decision*. The problem “ $2 + 2 = ?$ ” does not require decision making because it has only one solution. However, as a manager, you might face a dilemma such as “Which is the best way to promote the company’s new car?” There are many potential ways to promote the new car- television, radio, newspaper, Web advertising, auto shows, direct mail, or any combination of these methods. This dilemma calls for decision making.

Both problem solving and decision making require information. Gathering the right information efficiently, storing it so that it can be used and manipulated as necessary, and using it to help an organization achieve its business goals are the keys to success in business today. The purpose of IS is to support these activities. In addition to solving problems and making decisions, businesses use IS to support daily operations, such as electronic commerce, making airline reservations, and many other activities. As a professional, you need to understand and apply information fundamentals to succeed.

*Simple needs* are of routine nature, based on clearly structured questions leading to routine actions or simple decisions; they use data from a single source or a small number of easily accessible sources; procedures to produce results are few and mostly controlled by single own information system; results are a direct product or simple by-product of existing IS.

*Complex needs* are much less of a routine nature; they are often based on vaguely structured questions; require composite results drawn from data sources that are numerous, incompatible, eclectic and often external; use heterogeneous data and procedures; there is an increased role of soft information and judgment; the sources and conditions of their use are not controlled by own IS; such needs cannot be exactly estimated before-hand and are hard to plan.

The multifaceted nature of complex needs suggests some dimensions for their possible classification, with subsequent differences in satisfaction approaches.

**Urgency:** One extremity is emergency situations that need quick yet well-grounded decisions in a fast-changing environment; the other pole is non-emergency situations – e.g., acquisition, 31

privatization, strategic foresights. Support-wise, urgent needs should require the presence of emergency informing systems.

**Coverage:** On one hand, there are situations with wide scope, affecting the whole organization; on the other hand – a narrow yet complicated problem area; in the latter case we deal with reduced set of dimensions, and at the same time the need to go down into the “information silo” of the narrow area.

**Required precision:** In some cases, a rough estimate of a situation is sufficient; in other cases, exact or near-exact results are required. For rough estimates there are “quick fix” models; for accurate calculations and estimates issues of source information quality and reliability come up. This dimension is related to urgency in a sense that urgent situations usually do not allow for time-consuming thorough estimates and have to deal with quick and rough assessments.

**Heterogeneity:** defined by many or few information sources, procedures, or participants. Highly heterogeneous needs would require information integration mechanisms for source heterogeneity; unified or transparent environments for procedure integration; convenient communication channels for participant input integration. This dimension is related to coverage in a way that problems of a wide coverage invoke use of a number of information sources, procedures and participants.

**Structured ness:** Although complex information needs by their nature are on the unstructured side, variations are possible in a sense that some problems possess more structure than others – e.g., in the area of company mergers and acquisitions the principal set of procedures, although rather complex, is known beforehand; the launching of an innovative business model which had not existed before is considerably less structured.

**Associated risks:** defined by size and probability of possible loss if incorrectly assessed. The high-risk situations require the use of risk-estimating procedures and evaluation of different scenarios; information triangulation and cross-checking for reliability of multiple sources might be used for increased reliability of results.

## 2.7.2 Information Sources of Managers

**Internal Sources of Information:** The sources of information that you use in your business can be primary information or information that you obtain yourself inside your own company. This is

also known as internal information. There are different types of internal information such as financial, personnel, marketing, purchasing, sales, manufacturing and administration. Internal information sources can be defined as follows:

- i. ***Financial Information:*** is information related to the performance and profit and loss of the company. This will include information on how much you pay for items, how much you pay staff, the costs of rates and the taxes that you pay as a business. To monitor the financial information, you need to have a Financial Controller or Accountants to ensure that the business continues to operate and generate a profit.
- ii. ***Personnel Information:*** is information held by the company on their employees. HR division's must retain and provide this information freely available to the employee any time that they request it. Personnel information can be used to monitor how long an employee has worked for a company and if they are entitled to a salary increase due to this based on the company policy. Other information may be held such as the productivity rate of an employee and a bonus might be given based on performance and targets. It is import that the company has up to date information on all employees for health and safety reasons. Companies also need to get proof of qualifications from employees to ensure they are suitably qualified for a certain position on entry to the company. The employee can progress within the company after their information is updated with any internal or external training programs that relate to their job.
- iii. ***Marketing Information:*** is used by the market team to identify what products or services offered by the business are most successful. The marketing team can collect information from different departments such as sales to promote certain products or services based on current success rates. Marketing information can be obtained using external sources or by using surveys to see what customers like or dislike about your product or service. This information can be used to streamline or improve your business & keep customers happy.
- iv. ***Purchasing Information:*** is collected by the purchasing department who are involved with buying all of the products needed to run your business. These products could be stationary or computers need for the day to day running of your business or multi-million parts used in your manufacturing process. The purchasing department needs to monitor the cost and quality of all purchased goods to ensure they get the best deal and maximize profits for the company.


- v. **Sales Information:** Just like the purchasing information sales information needs to be monitored based on the product or services offered by your company. This information needs to be passed to the financial controllers of your companies to ensure that the cost of your good or service is less than the sale price. If the sale of a certain product is down then this information would need to be passed to the marketing team to see if it is worth launching a new marketing campaign to increase sales of the product.
- vi. **Manufacturing information:** This is information about the cost of manufacturing goods within the company. The manufacturing cost will normally include the running cost of all machinery, the wages paid to production staff and the cost of raw materials (including waste) used up in the manufacturing process.
- vii. **Administration Information:** Administration information links very much with personnel information but also involves communicating with external sources and storing information on customers to build successful relationships with them.

**External Sources of Information:** Companies can also use external sources to help them make the correct business decisions. Examples of external information sources are: Government, trade groupings, commercially provided information, database and research. If a company uses external sources of information then they must be sure of the reliability of the data sources.

- i. **Government:** Information supplied by the government is definitely coming from a reliable source as this is the governing body that they business operates within. Companies need to use important legal information from the Government to help run the business successfully and legally. For example, if a company had over 1,000 employees that were being paid the minimum hourly rate as outlined by the Government and the rate changes then the company needs to take this information on board and increase the wages for the staff on this wage range. Another example would be if the Government offered businesses grants for opening manufacturing plants in areas of high unemployment a company might use this information to their advantage to set up a new plant at a lower cost than in another area.
- ii. **Trade Groupings:** A trade grouping is a group of businesses that operate within the same sector and not within the same location. For example, tech companies would be part of the Technical Trade Association and Farmers might be part of the Farming Association within a country or region. As a business being a member of a trade grouping enables you to access information that helps you run your business successfully. For example, solicitors are part of

the legal trade and will have memberships that give them access to the latest laws that they must use to support their clients in the best possible way.

- iii. **Commercially Provided:** Companies can use commercially provided information to help them make the correct business decisions. These decisions are made based on information made available to them from other companies. For example, a hotel group might use the information about the number of flights to and from a number of airports along with the information on the number of hotels beside each airport to make a decision on where to open their newest hotel. A games development company might make a decision on what platform to create a game for based on the number of units sold for each hardware platform. For example, if apple released sales figures for the iPhone 5 and they were much less than Samsung's Galaxy S6 then the company would probably target to release their latest game for the Samsung phone first.
- iv. **Databases & Research:** Companies can research information that might help them increase the sales and level of interest in their business. The key thing to researching information that helps run your business to ensure it is accurate and reliable. Some companies will pay to access commercially available databases that offer a range of information directly based on their business sector. Many companies can make money creating this information by analyzing currently available sales stats in particular business sectors. When using any external information source, it is absolutely essential to be sure about the reliability of the data sources and sometimes it is worth paying to access relevant information.



**Reflective activity**

List and explain the difference between data, information, knowledge, and wisdom? --

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## 2.8 A Framework for Information Systems

A useful conceptual framework that organizes the knowledge and outlines areas of knowledge you need to know about IS. It emphasizes in the following five areas:

**Foundation Concepts.** Fundamental behavioral, technical, business, and managerial concepts about the components and roles of information systems. Examples include basic information system concepts derived from general systems theory or competitive strategy concepts used to develop business applications of information technology for competitive advantage.

**Information Technologies.** Major concepts, developments, and management issues in information technology—that is, hardware, software, networks, data management, and many Internet-based technologies.



**Figure 2.3:** A framework that outlines the major areas of information systems knowledge needed by business professionals.

**Business Applications.** The major uses of information systems for the operations, management, and competitive advantage of a business. Applications of information technology in functional areas of business such as marketing, manufacturing, and accounting. E-commerce applications that most companies use to buy and sell products on the Internet, and the use of information systems and technologies to support decision making in business.

**Development Processes.** How business professionals and information specialists plan, develop, and implement information systems to meet business opportunities. Several developmental methodologies, including the systems development life cycle and prototyping approaches to business application development.

**Management Challenges.** The challenges of effectively and ethically managing information technology at the end-user, enterprise, and global levels of a business. Thus, on security challenges and security management issues in the use of information technology, while some of

the key methods business managers can use to manage the information systems function in a company with global business operations.

## **2.9 Business systems**

Systems and processes are the essential building blocks for companies. Every facet of your business on the shop floor, in the warehouse or in the office is part of a system that can be managed or improved by applying correct principles. A business system is designed to connect all of an organization's intricate parts and interrelated steps to work together for the achievement of the business strategy. *When we apply defined principles and practices to the systems and processes that deliver value to our customers, we're creating what is often referred to as a "business system."*

Creating effective business systems often unifies the problem solving and decision making of the organization. Many common tools and methodologies are universally taught and expected to be utilized by all levels. Several key management structures, such as a full-time Performance Excellence office or systematic maturity assessments, are made a permanent part of the infrastructure. The business system also encompasses how we lead our people and connect them to the operational strategy.

### **2.9.1 Importance of Business System?**

There are several reasons to implement a business system:

**Improving Top-Line Performance:** Part of the business system is the development and implementation of strategy creation, business processes and strategic planning throughout your organization. Those foundational elements lead to a much more insightful way to investigate and grow top-line revenue. In short, a business system takes care of your future. It ensures you meet your customers' expectations and improve your brand, which are key to growing a healthy business.

**Meeting Customer's Expectations:** If you use a systematic approach, your organization will analyze, measure, compare and test all the possibilities of what your customers want and don't want. You will have constant information on areas that need to be improved and, even more importantly, you will begin to understand the unmet needs of customers. A business system is

key to improving the brand that the organization projects to your community, including customers, employees and suppliers.

**Consistent Results:** Whether we are considering safety, quality or getting the job done in a timely manner, a business system is designed to give you effective, efficient and repeatable results. In short, the business system gives you a “process to fix your processes.”

**Employee Engagement:** The goal of the system is to enable proper education and opportunities to all employees so they can complete their work more efficiently and effectively. We also seek to harness their ideas and creativity and, in the process, increase their personal engagement. Additionally, having the system in place allows you to quickly integrate new-hires, and makes it easy for them to see their role within the organization and bring forth new ideas.

**Reduce Cost and Increase Profits:** It has been proven time and again that the implementation of a sound business system helps reduce costs, but so will many things. A business system is intended to reduce costs without taking the shortcuts that often lead to an erosion of profitability due to the necessity to lower quality expectations or service levels.

## **2.9.2 Futures of business system**

Basic Features of a Business System are as follows:

**1. Purpose:** A system is purposeful, goal-oriented entity. Purpose is the basic reason for a system’s existence. Purpose provides a sense of direction to a system. The purpose of a business system, for instance, is to earn profits through provision of goods and services to the society.

### **2. Environment:**

Each system is a part of its environment, called ‘supersystem’. Environment includes all those factors external to a system that affect it and are uncontrollable to a large extent. There is a constant interaction between a system and the environment. The impact of these environmental factors is so powerful on the functioning of a system that it is almost impossible for a system to exist and grow without taking them into account. The environment of a business system, for instance, includes all those economic, legal, technological, political, and social factors which influence its functioning, but are outside its control purview to a great extent.

**3. Sub-systems:**Sub-system constitutes the operating level of a system. The parts that make up the structure of a system are called sub-systems. And each sub-system, a system in itself, in turn, may be a sub-system of a still larger whole. Thus, a department is a subsystem of a company, which may be a sub-system of the industry (group of companies), which is a sub-system of the national economy as a whole, which is a sub-system of the world system.

**4. System boundary:**Each system has a boundary; this means choosing which entities are inside the system and which are outside-part of the environment. In a closed system this boundary is rigid and solid; in an open system, the boundary is more flexible. In the context of a business organization, it has many boundary contacts or ‘interfaces’ with many external systems like suppliers, creditors, customers, government agencies, etc.

**5. Input-output conversion process:**A business system involves ‘input-output conversion’ process. The essence of this process lies in the fact that a business system imports inputs (like materials, equipment, human effort, technology, and information) from external environment, transforms them (through the organizational and managerial processes adopted by the sub-systems), and exchanges or exports output (like goods and services) to the external environment.


The whole process is a source of energy for the organization. The output is worth more than the input some value is added by the transformation process. The output exported into the environment provides the source of energy for the organization to recycle the process continuously. The organization renews itself, survives, and grows by the recycling of energy on a sustained basis.


#### **6. Feedback:**

Feedback is the key to system enrolls. As operations of the system proceed, information is feedback to the appropriate people or perhaps to mechanical devices so that the work can be assessed and, if necessary, corrected.

**7.Synergy:** it means that the whole is greater than the sum of its parts. It means  $2 + 2 = 5$ . In organizational terms, synergy means that as separate departments within an organization cooperate and interact, they become more productive than if each had acted in isolation.The

enumeration of the various basic concepts (or features) of a business system unmistakably suggests that a business enterprise is an open, adaptive, goal-oriented system with its





**Reflective activity**

What are the reasons of establishing business system? Why business expected to have its own system -----  
-----

environment acting as supra-system.

## 2.10E-business

E-business is short for “**electronic business.**” As an **overarching term**, it refers to any method of utilizing digital information and communication technologies to support or streamline business processes – from preparation to implementation. However, it can also refer more specifically to the business processes of online stores or other internet-based companies.

E-business or e-commerce is business based on electronic communications: e-mail, web-based marketing and operations, videoconferencing, and other virtual business environments. Successful e-business entrepreneurs possess knowledge and skills in Internet marketing, web page design, interactive multimedia applications, database management, project management, and fundamental business subjects. E-business is a general term that encompasses all forms of using digital information and communication technologies to support and optimize business processes. In contrast, e-commerce describes only the online trading of products and services, and

is therefore only a subsection of e-business.

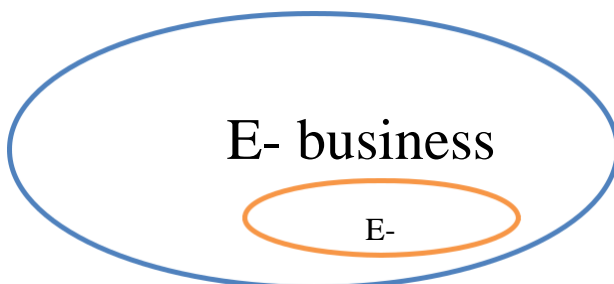


Figure 2.4 e-business Vs e-commerce

### 2.10.1 Components of electronic business

The core components of e-business are **information, communication, and transaction**. Business partners use digital networks (i.e. public or private communication networks) to conduct business processes using innovative technologies to improve efficiency. There are key areas are particularly important for e-business:

**E-procurement:** the electronic sourcing of products and services by companies, focused on reducing costs and effort.

**Online stores:** the electronic sale of products and services via appropriate platforms, such as online stores.

**Online marketplaces:** electronic commerce via digital networks, connecting the buyers and suppliers of products and services.

**Online communities:** electronic communication network between individuals and organizations, which supports data and knowledge sharing as well as the preparation of transaction decisions.

**Online companies:** electronic business cooperation for connecting individual company services, resulting in a virtual business with a common transaction offer.

## **Chapter summary**

MIS is an organized method of providing past, present and projection information relating to internal operations and external intelligence. It supports the planning, control and operational functions of an organization by furnishing uniform information in proper time frame to help the process of decision-making.

An information system (IS) can be any organized combination of people, hardware, software, communications networks, data resources, and policies and procedures that stores, retrieves, transforms, and disseminates information in an organization.

The components of IS contain different resources such as people, software, hardware, network, and data resources for the purpose of making desirable system functionality.

Functional departments like sales, administration, marketing, finance, operations, human resources and IT, or information technology are a business function. And activities that managers should perform to achieve organizational goals like planning, organizing, staffing, directing or leading and controlling is a function of manager.

Data must be extracted, sorted, and analyzed to become information. Information must be studied, organized, and learned to become knowledge. Knowledge must be put into action and be experienced to become wisdom. Wisdom leads to the discovery of new or amended data. And the process goes on and on.... These components work together to establish and refine a system.

A business system is designed to connect all of an organization's intricate parts and interrelated steps to work together for the achievement of the business strategy. When we apply defined principles and practices to the systems and processes that deliver value to our customers, we're creating what is often referred to as a "business system."

E-business or e-commerce is business based on electronic communications: e-mail, web-based marketing and operations, videoconferencing, and other virtual business environments.

## Exercise Questions

1. Which one is a correctly ordered bottom to up?
  - a. Information.....data..... wisdom..... knowledge
  - b. Data.....knowledge.....information..... wisdom
  - c. Data..... information.....knowledge.....wisdom
  - d. Data.....wisdom..... information.....knowledge
2. E-commerce is equivalent with e-commerce. True or false
3. Is not a component of information system
  - a. People    b. input    c. environments    d. communication    e. none
4. Is not a futures of business system?
  - a. Purpose    b. environment    c. employees    d. synergy    e. none
5. The managers of management degree of information need is always similar. True or false
6. What is the difference between information system and business system-----  
-----  
-----  
-----.
7. List and explain the importance of information system for business organization?-----  
-----  
-----
8. Provide practical examples of business system from your experiences?  
.....
9. What do you think about e-business and its importance in today's business environment?  
-----  
-----

## **Chapter Three**

### **3. Information Technology**

#### **3.1 Chapter Objective**

Dear learner, welcome to the third chapter of your module of management information system! In this chapter, you will learn the definition and concepts of hardware like computing, storing and communicating; program software like system and application one; database management and communication technologies. Realize the essence of the chapter so that you will be in a better position to easily understand the concepts of the upcoming chapters. Enjoy reading each section with curiosity.

Dear learner After studying this chapter, you have capable to did the following:

Understand hardware and its component

parts Understand software and its type.

Understand database management

Understand communication technologies

Understand the interconnection between hardware, software, communication technologies and DBM

#### **3.2 Introduction**

Currently information systems are relying on computers and computer peripherals to capture, process, and store and produce outputs. Students of management should understand how computers capture, process, store, produce output and communicate the result. This involves different information technologies: hardware, software, network, and database.

At a center of modern information system stands at least one computer. Few machines have changed human life as radically as electronic computer. It has revolutionized the way we gather and process data and produce information. Few machines have become affordable to so many businesses and individuals in such a short time. This chapter enables you to make wise and intellectual decision with regard to your hardware, software and network decisions. Hardware refers to physical components of a computer while software refers to the sets of instruction that direct the hardware to perform a particular job.

### **3.3 Hardware components**

Regardless of size, age and function or capability, all computers have the same basic components and operate according to the same basic principles. A computer must handle four basic operations: accept data, store data, process data, and output data or information. In recent years computers are also expected to communicate over a network. Computers conduct these basic operations with similar equipment.

#### **3.3.1 Classification of computers**

Computers come in variety of sizes ranging from handheld to supercomputers. Computers are classified by their power: processing speed and storage capacity. However, the lines between the classes are not clear. Two vendors may call the same type of computer by different name. The more powerful the computer is the more will be the price.

##### **Supercomputers**

Supercomputers are the most powerful computers at any given time. Usually they are also the largest in physical size and most expensive computers. Universities, research institutions, and large corporations engaged in research and development are most likely to use them. Supercomputers main memories consist of billions of bytes, and their processing speed is billions of instructions per second. They cost 10 to 30 million dollars.



Figure 3.1 supercomputer

Super computers contain multiple processors that let them perform parallel processing and run at great speed. In parallel processing sometimes called **multiprocessing** several CPUs process different data at the same time. Uses of supercomputer include calculation of satellite orbits, weather forecasting genetic decoding, optimization of oil exploration, and similar testing of products that otherwise cannot be tested because of price or physical difficulty, as in the case of building space station.

### **Mainframe computers**

Main frame computers are less powerful and less expensive than supercomputers. They cost several thousand to several hundred thousand dollars. Businesses that must store large amounts of data in central computer so that users in many departments can access them often use mainframes. Among them are banks, insurance companies, large retail chains and Universities. Processing speed of mainframe computers is not greater than that of fastest PCs; however, their internal memories is significantly bigger often measure in GB.



Figure 3.2 mainframe computer

### **Midrange computers**

Midrange computers are smaller than mainframes and less powerful. An earlier name for midrange computers is minicomputers. Priced from several thousands to few hundred thousand dollars the machines are often used as servers in networks of smaller computers. Like mainframe computers midrange computers often use multiple processors. They usually serve four to 200 users simultaneously.



Figure 3.3. midrange computer

### **Microcomputers**

As of the late 1980s companies have moved from larger computers to smaller computers. Typically, companies have replaced their mainframes with a network of powerful microcomputers. Microcomputers the collective name for all personal computers (PCs) as well as smaller computers. More powerful micros are sometimes called workstations. Workstations are typically used for computer aided design (CAD), computer aided engineering (CAE), complex simulation, and scientific applications.



Figure 3.4 micro computer

The power of microcomputers in terms of speed and memory capacity has doubled about every 18 to 24 months. Sharp price drops have made PCs very attractive to even the smallest business. In today’s mobile society computers are increasingly used outside the office. Note book or handheld computers are used to record and retrieve data for people on the go. The notebook computer also called *laptop* is a compact light personal computer powered by rechargeable battery.

In today’s mobile society, computers are increasingly used outside the office. **Notebook or handheld computers** are used to record and retrieve data for people on go. The notebook computer also called laptop is compact, light and personal computer empowered by rechargeable battery. Its monitor is flat. When folded, the computer looks like a small flat box and can be carried in a briefcase. Most laptops can operate up to 8 hours without recharging their batteries. Many notebooks have accessories that enable the user to communicate with other computers and even send and receive faxes. The latest development in computer is the **tablet computer** often called a tablet PC. It is a full power PC in the form of a thick writing tablet. It looks like a notebook computer without a keyboard, although it can be connected to a keyboard and a mouse. Instead a mouse the user, the user uses stylus. The user can handwrite text, which automatically turns into a typed text.

### 3.3.2 Input devices

Computers have to receive input in order to produce output. Computer receives input in different ways. The means of entering data in to a computer system is called



input devices. There are different methods of feeding data in to computer: Keyboard, mouse, touch screen, source data automation, imaging, and speech recognition. The most common of all is keyboard. Look the following input devices:

Figure 3.5 input devices

**Keyboard:** The keyboard lets users enter data and instructions in to a primary memory and instruct programs to run. All keyboards have several function keys numbered F1, F2 and so on that can be activated to execute programmed functions, such as copying a highlighted text. Many programs let users' program function keys and other key combinations such as Alt and Ctrl to create macros; sets of commands that perform customized tasks.

**Mouse trackball and track pad:** A mouse is an input device that controls an on-screen pointer to facilitate the point and click approach to executing different operations. It is most commonly used with a keyboard, although most programs use it exclusively. Mice have one to five buttons that let the user place the pointer anywhere on the screen, highlight portions of the screen and select items from menu. When the user moves the mouse on the surface of the desk or the pad, the computer detects the movements, translates them in to digital coordinates on the screen and moves the pointer to imitate the mouse's movement. A trackball is similar to a mouse, but the ball moves with in the device, rather than over the surface. With a track pad, a user controls the cursor by moving his or her finger along a touch sensitive pad. Many mice and trackballs have a built-in ring that helps scroll pages displayed on the monitor. Many people prefer to use wireless input devices, most which work with infrared or radio-frequency technology. These units give users flexibility.

**Touch screen:** Sometimes a single device, such as a touch screen may serve both as an input and output device. A touch screen lets the computer user choose operation by touching a position on the computer screen. There are several types of touch screens. In one type, the touch pressure causes electrical contact between the conductive and resistive layers of the screen. An electrical current move through the screen indicating to a sensing device the point on the screen, and therefore, the users' choice. Another uses acoustic waves over a clear glass pane with a series of transducers (devices that covert pressure into an electrical signals) and reflectors. When a finger touches the screen it absorbs the wave, thereby indicating the touch location. Some common public applications use touch screens to provide advice to tourists,

select lottery number.

**Source data input devices:** In some organizations the speed of data entry is a top priority. These types of businesses use machine reading devices **barcode readers** known as source data input devices. They copy data directly from the source without human intervention. They can also record data directly from other sources such as credit cards and checks.

**Source data technology:** Mark recognition devices are essential to successful source data entry. Special devices use **optical mark recognition** to detect the position of marks on the source documents, such as standardized test response forms. Optical bar recognition senses data in the series of thick and thin black bars in bar code.

Another far less accurate technology used for source data entry is **optical character recognition** (OCR). Unlike optical mark recognition, OCR is often used to try to interpret handwritten and printed texts not originally designed for source data entry. A device called scanner scans the pages and translates each character into a digitalized representation. OCR is not optical mark sensing. In Optical mark sensing the scanner senses the position of the mark not what the mark exactly is.

With huge number of corporate and personal checks processed daily by banks, entering check data manually was extremely slow and expensive. To facilitate source data entry, the bank identification number, account number, and check number are printed in special magnetic ink at the bottom of each check. Special device called a magnetic ink reader uses magnetic ink character recognition to detect these numbers.

**Credit cards** also facilitate source data entry. Card numbers and other data are coded on the magnetic strip on the card's back. When you charge a purchase with your credit card, a person at the point of sale passes the card through the reader to record the account number and your name and address. The total amount charged either is keyed or recorded automatically from the cash register.

**Speech Recognition:** In some work environments, using manual input devices is either impossible or inconvenient. In other situations, such as customer service, using computer to respond automatically to a spoken computer queries can save labor cost. Instructing machines by speech can help in these instances. Speech recognition is becoming a staple of

business. Speech recognition also called **voice recognition**- is the process of translating human speech into computer readable data and instructions. Although speech recognition systems vary in sophistication, all receive input from microphone and process it with software. The simplest speech recognition system has to learn a person's speech before being able to recognize and process it.

### 3.3.3 The central processing unit (CPU)

CPU is the computers brain, where all processing takes place. The CPU consists of two units: the control unit and the Arithmetic logic unit. These units' store and process data. The CPU is a silicon chip with multiple circuits. It carries signals that execute all processing with in a computer. Because the chip is so small, it is often called a microprocessor. processing unite



Figure 3.6 central

**Microprocessors:** are made of silicon embedded with transistors. A transistor is a semiconductor, a component that can serve as either a conductor or an insulator, depending on the voltage of the electricity that tries to flow through it. A semi-conductor conducts electric current of a certain minimum amount voltage along a special path, but blocks current that is lower than that minimum voltage. This property is excellent because it provides a means to represent binary codes of two states: *voltage conducted and voltage not conducted*. The greater the number of transistors that can be embedded in the chip the more powerful the microprocessor.

Electronic semiconductors in computers are called **integrated circuits**, because a large number of circuits are integrated on each silicon chip. Early microprocessors contained only hundreds of circuits, but very large-scale integration (VLSI) techniques enable engineers to install millions of circuits on one microprocessor today.

**Machine cycle:** When a program starts running in a computer, the CPU performs routine sequence. First a control unit fetches an instruction from a program in a primary memory and decodes it, that is, it interprets what must be done. The control unit transmits this code to other part of the CPU, the arithmetic logic unit, which executes the instruction. Usually the operation's

result is needed for further operations. Therefore, the control unit takes the result and stores it in primary memory. The control unit then fetches the next instruction, decodes it, and puts in the ALU, which executes the instruction. The control unit stores the result in primary memory and so on until the entire program is executed or something happens that stops the cycle. Anything that stops the process is called an **interrupt**. It can be an instruction, power failure, or any other event that stops the CPU.

The CPU performs four functions in every cycle: fetch, decode, execute and store. Each cycle is called **machine cycle**. Computers can perform billions of machine cycle per second. The rate of repetitive cycle is called frequency, or a clock rate. One cycle per second is called hertz. Computer frequencies are measured in megahertz (MHz, Millions of Hertz) or gigahertz (billions of hertz). The data word or word is maximum number of bits that the control unit can fetch from primary memory in one machine cycle. The words size is determined by the size of the CPU circuitry that holds information processing.

**Arithmetic or logic unit operations:** Arithmetic operations include addition, multiplication, division, subtraction, exponentiation, logarithmic calculation, trigonometric computations and other complex mathematical tasks. Logic operations compare numbers and strings of characters.

**Reduced instruction set computing:** Most microcomputers come with CPUs that support as many as 200 different instructions, referred to as complete instructions set computing (CISC). On the other hand, some microcomputers CPUs support a smaller instruction set. They are called reduced instruction set computing (RISC) computers. CPUs with fewer instructions run faster.

**Memory:** it can be classified in to two volatile and non-volatile. **Volatile memory** circuits depend on electric current to maintain information. When power to them is turned off the information they hold disappears. RAM and registers are volatile memory locations. **Nonvolatile memory** does not depend on electric power to maintain information. ROM and External storage media are non-volatile.

**Registers:** The CPU itself has specific areas designated for temporary storage and very rapid retrieval of data. Those storage areas are called registers. Both the control unit and ALU contain registers. The location in which the ALU accumulates the results of its operations during a machine cycle is a register called the **accumulator**.

**Primary memory:** A primary memory must exist in a computer for the CPU to do its job; many consider it to be another part of the CPU. Two types of storage space compose a computer's primary memory. The larger part is random access memory (RAM). All instruction and data must be copied to RAM before the CPU can access and process them. The smaller part, read only memory (ROM), is used for permanent storage of key instructions and programs then computer needs for basic operation; such as startup.

**Random Access Memory (RAM):** is where instructions and data are stored before the CPU fetches them for processing. The CPU does not deal directly with external storage devices, only with RAM.

**Cache Memory:** Virtually all new microcomputer models offer cache memory as part of RAM. Cache (pronounced as cash) memory is made up of fast memory semiconductor chips.

**Computer power:** Computer power depends on two main things: processing speed and memory capacity.

A computers speed is determined by:

- The CPU clock rate (cycles per second)
- Amount of information the CPU processes per cycle time (determined by the word size)

All other things being equal, the faster the clock rate, the faster is machine. And the larger the word size, the faster the machine will be. Computer speed is also measured in MIPS (millions of instructions per second) which is an accurate measure, because instructions have various levels of complexity. However, computer speed expressed in MIPS is often used to indicate the overall processing speed because all the factors that affect processing speed are considered.

### **3.3.4 Output devices**

Output devices include all electronic and electromechanical apparatus that deliver the results of computer processing. We receive most information in visual form either on screen or on paper. Non-tangible (electronic) output, such as picture on computer monitor or a file stored on a disk, is called **softcopy**. Table output, such as information printed on paper, is called **hardcopy**. There are different output devices. Look the following output devices:

❖ **Softcopy output devices:** Softcopy output devices include images, sound or both. Images

include text and picture. Sound includes speech, music and other audio signals.

- ❖ **Monitors:** The most common output device is the computer monitor, which looks like and uses technology similar to a television screen. There are two major types of monitor: cathode ray tube and flat panel display. Images on a monitor are made up of small pictures called pixels.
- ❖ **Cathode ray tube:** In cathode ray tube monitor, the inner side of the screen has a layer of tiny phosphoric dots, which make up the pixels. These dots respond to electronic beams by displaying different colored light. An electron gun receives instruction from the computer and sweeps the rows of pixels, spraying a ray of electrons. When electrons hit a pixel, the pixel emits light for a limited time. The electron gun bombards some pixels and skips others, creating a picture on screen. The picture can be of text or images.
- ❖ **Flat panel monitors:** Flat panel monitors are used on notebook and handheld computers for a long time. Flat panel have also gained popularity as monitors for personal computers. They use a different technology form the cathode ray tube monitor to display output. The advantage of flat panel monitors is their slim profile and their projection of sharper images. One common type of flat panel monitor is the liquid crystal display. In liquid crystal display a conductive film-covered screen is filled with a liquid crystal whose molecules can align in different planes when charged with a certain electrical voltage. The proper voltage applied to a segment of the screen disrupts the crystal's regular structure on those areas, causing it to block light. Light continues to pass through the rest of the liquid. This combination of light and dark areas produces image of characters or pictures.
- ❖ **Speech output:** Most information we receive from computers is visual, but computers are also to provide elaborate auditory output far beyond response to keyboard commands and playing music CD. Computers are also used to respond with human like voice.
- ❖ **Hardcopy output:** A hardcopy is any tangible, permanent copy of computer output. When people ask for a hardcopy, they almost always mean a paper copy. Computers are connected to an essential peripheral device called printer. There are classified in to two basic types depending on the technology that use to create images on the paper: impact and nonimpact.
- ❖ **Nonimpact printer:** Nonimpact printer because it produces images on a page without

mechanically impacting the paper. Nonimpact printer include laser, ink-jet, electrostatic and electro-thermal printers. Laser printers are also page printers because they print one whole page at a time. Laser and ink-jet printers produce very high-quality output, including color. Laser printing technology can create typeset quality equal to what we see in magazines and textbook. Electrostatic and electro-thermal printers produce low quality output. All nonimpact printers have few moving parts than impact printers and are, therefore, significantly quieter.

❖ **Impact printers:** produce an image on a page using mechanical impact. Character printers create one character at a time in a manner similar to typewriter. Thimble and daisy-wheel printers have rotating heads with all characters needed for word processing. A character hammer hits the ribbon and impacts the paper. These printers create letter quality output, because character shapes are solid. However, they are suitable for graphical output. The print head of dot matrix printers consist of little pins. When certain pins strike the ribbon against the paper, they make the shape of a character or another form on the paper. Dot matrix printers produce low quality outputs.

### 3.3.5 Storage devices

**External storage media:** To maintain programs, data, and information for later use, data must be stored on a non-volatile medium. You may also need to move stored data to a computer that is not part of the network, and you need to backup important programs and data as well. External storage media must be used for this purpose. External storage devices come in different forms and use different materials, each with strengths and weaknesses. Important properties to consider are capacity, cost, access speed, and access mode.

*Capacity* is the amount of data the medium can hold per area of its surface. *Access speed* is the amount of data that can be stored or retrieved per time unit. *Access mode* refers to the organization of data on the medium, either random or sequential. Storage devices differ in the *technology* they use to maintain data (such as magnetic or optical) and their physical structure (disks, tape or other forms). *Physical structure* may limit ways in which data can be organized on the medium. While disks allow any type of organization, tapes allow only sequential organization.

**Modes of Access:** There are two basic types of data storage: sequential and direct (random)

access storage. In sequential storage, data is organized sequentially one record after the other, with a logical order, such as by ID or part number. With sequential storage, to read data from anywhere on the tape, you have to read through all the data before that point on the tape. Recovering files from sequential devices is slower and less convenient than devices that utilize direct storage. In direct access storage, records are not organized sequentially. Direct access organization of data is used on magnetic and optical disks. Direct storage lets you access data by address or location on the disk & find specific data much faster. The organization is called direct because it is possible to retrieve data directly without processing other records as you search for the desired one. Tapes & other sequential storage media are suitable when processing a large percentage of the stored data & for backup purposes; they are much less desirable when only small amounts of data need to be retrieved at a time, or when response time must be short. Sequential access storage media are not suitable for processing databases. When quick access to a single record or to small number of records is desired, direct access storage media are used.

**Magnetic tapes:** Magnetic tape similar to those used in tape recorders and VCRs are also used to store computer data. They are made of polyester coated with an easily magnetized substance, such as ferrous oxide or chrome oxide. Information is coded in patterns of tiny magnetized areas. On old tapes, each column of magnetized and non-magnetized spots across the tape represents a character.

**Magnetic disks:** The most widely used storage media is the magnetic disk. Magnetic disks include hard disks, floppy disks, and Zip Disks. As with information on the magnetic tape, information on magnetic disks is coded in magnetized spots on the disk's surface. The 3.5-inch floppy disks were once common, but are now being replaced by rewritable CDs and other newer media.

A PC always comes with at least one hard disk-built in. a hard disk is a stack of several rigid aluminum platters installed in the same box that holds the CPU & other computer components. In this common case, the disk is internal. An external hard disk is portable; it easily can be connected to or disconnected from the computer without opening the computer box. External hard disk usually cost 50 to 100 percent of their internal hard disks with the same capacity. A growing number of external hard disks connect to PC through a Universal

Serial Bus (USB) port.

**Optical discs:** On Optical discs, data are recorded by treating the disc surface so that it reflects light in two different ways. The two types of reflections back to a special detecting device represent the one and zero of digital coding. There are two basic categories of optical discs: Compact discs and Digital video discs or DVDs (sometimes called digital versatile discs). There are several types of CDs- CD ROM (compact disc read only memory), CD-R (CD Recordable), and CD-RW (rewritable). CDS have diameters have of 3.1 to 14 inches, but the most common ones are 12 Cm in diameter.

DVDs are 4.75 inches in diameter. The main advantage of CDs over magnetic disks is that they are less expensive and can hold more data in a given surface area; and a DVD can store significantly more data than a CD. The disadvantage of optical discs is that data is stored on and retrieved from them more slowly than data on magnetic disks.

**Optical tape:** Optical tape uses the same technology as optical discs to store and retrieve data. The only difference is that the bits are organized sequentially as they are on magnetic tape. Like magnetic tape, optical tapes are made as reels or cassettes. Their storage capacity is enormous. The storage capacity of optical media is greater than that of magnetic media. But their retrieval speed is slower.

**Flash Memory and Thumb drive:** Flash memory & thumb drives are becoming popular for both primary memory & external storage, especially because of the growth of portable digital devices. Flash memory is a memory chip that can be rewritten and hold its content without electric power. It is widely used for communications devices and electronic products as well as a variety of handheld devices such as digital cameras. Flash memory chips have usually lifespan of up to 1 million cycles, each cycle means overwriting the content of the chip.

Flash memory can be installed inside a computer or housed in a removable device. Some removable flash memory devices are the size of credit cards but most are smaller. One type of flash memory is memory stick which is used in digital cameras and other handheld devices. When the memory stick is full, it can be easily replaced by another memory stick for continued storage of digital images or other data. Once loaded into a computer's hard disk, the sticks content can be erased and the stick reused. One type of flash memory that is growing in popularity is thumb drive. As their name suggests, they are about the size of

adults thumb, and act as a portable disk drive. They plug in a computer through the USB port.

#### **3.3.4.1 Business Considerations in Evaluating Storage Media**

Before spending money on storage media, a manager has to consider several factors: purpose of data storage, the amount of data to be stored, the required speed of data storage and retrieval, how portable the device needs to be, and cost.

**Purpose of data storage:** The first factor to be seen in determining which type of storage media to use is the purpose of storage. If a manager is storing data for a backup purpose alone and not for processing it is advisable to use magnetic tape or CDs. Magnetic tape is less costly and can hold more amount of data. If the users need to access data quickly, then magnetic disks are the choice. If the information is archival such as Encyclopedias or maps used by library patrons, the information should be placed on CDs or DVDs because the user needs fast, direct retrieval of specific information and might not tolerate sequential search for the information.

**Amount of data stored:** When storage volume is the most important factor, managers must consider price per megabit or megabyte that is the ratio of dollar spent to storage capacity. If large volume of data has to be stored, magnetic tape and CD-Rs is ideal choice. But if large volume of data that must be retrieved quickly is to be stored, then the DVD is the good choice.

**Speed:** The speed of magnetic disks used in PCs is often measured in rotation per minute (RPM). Current disks come with speeds of 5,400, 7,200 and 10,000 RPM.

**Unit space and portability:** Sometimes the cost of gigabyte stored may not be most important consideration, but the physical size of storage medium is. A portable hard disk drive may be economical and fast, but it is more practical for a traveling salesperson to travel with CDs full of data than with an external hard disk. Even though CDs are significantly less expensive than thumb drive, sales people are more likely to travel with thumb drive because they fit in shirt pocket.

**Costs:** Once managers agree on the best type of storage device to store data for particular business use, they need to consider cost. The approach is how to obtain larger storage space for smallest amount of money.

**Reliability and life expectancy:** Although this are not usually the highest priority, business must also consider storage mediums reliability & life expectancy. For example, optical disks are more reliable & durable than magnetic disks. Magnetically stored data remains reliable for about 10 years, whereas CDs are expected to store data reliably for 50 to 100 years.

Medium	Storage capacity	Transfer rate	Cost (per 1MB)
Magnetic Hard disk	High	Fast	Moderate
Magnetic Tape	Moderate	Slow	Very Low
Optical tape	Very high	Very slow	Low
CD	High	Very slow	Low
DVD	Very high	Moderate	Very High
Flash Memory	High	Moderate	Very High

Table 3.1 comparison

### Considerations in purchasing Hardware

Decision about purchasing computers are usually made by an organization's IS professionals or with the help of a consulting firm. But surveys show a new trend: involving end users in decision making process. More and more companies realize that effective use of computers depend on whether their employees are satisfied with the computer and other equipment installed in their workplace.

Managers must consider the following factors when buying hardware:

- ❖ The equipment's power- its speed, its memory size, and the capacity of its storage devices
- ❖ The equipment's expandability- some computers allow RAM expansion through the addition of RAM chip in to motherboard.
- ❖ The number and type of ports, sockets used to connect the computer to external devices, printers, hard disks, scanners, remote key boards and pointers
- ❖ Monitor type and resolution – higher resolution is more pleasing and less straining to the
- ❖ eye. Ergonomics- an ergonomic computer does not strain eyes and arms

- ❖ The hardware foot print- if space is scarce, you want to consider the size of the computer and its peripheral equipment's
- ❖ The reliability of the vendor, the warranty policy and the support given after the warranty expires
- ❖ Compatibility – when software and peripheral devices from one computer works with another computer, the machines are said to be compatible. Efficiency- the hardware that employees use should not only run. But run it efficiently.
- ❖ Cost- careful study yields hardware with excellent performance for affordable price.

### Updating hardware

Businesses tend to update their software when a new version is available; but many still maintain old hardware. Companies avoid cost of purchasing new hardware by doing so; however, this may cost companies a lot of loss in productivity. This mainly results from the fact that newer software cannot run as fast or as reliably on old machines.



**Reflective activities**

What are the importance of studying computer hardware peripherals for management decisions? \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_.

### 3.4 Computer software

Broadly speaking there are two types of software: application software and system software. The following diagram depicts the difference well.

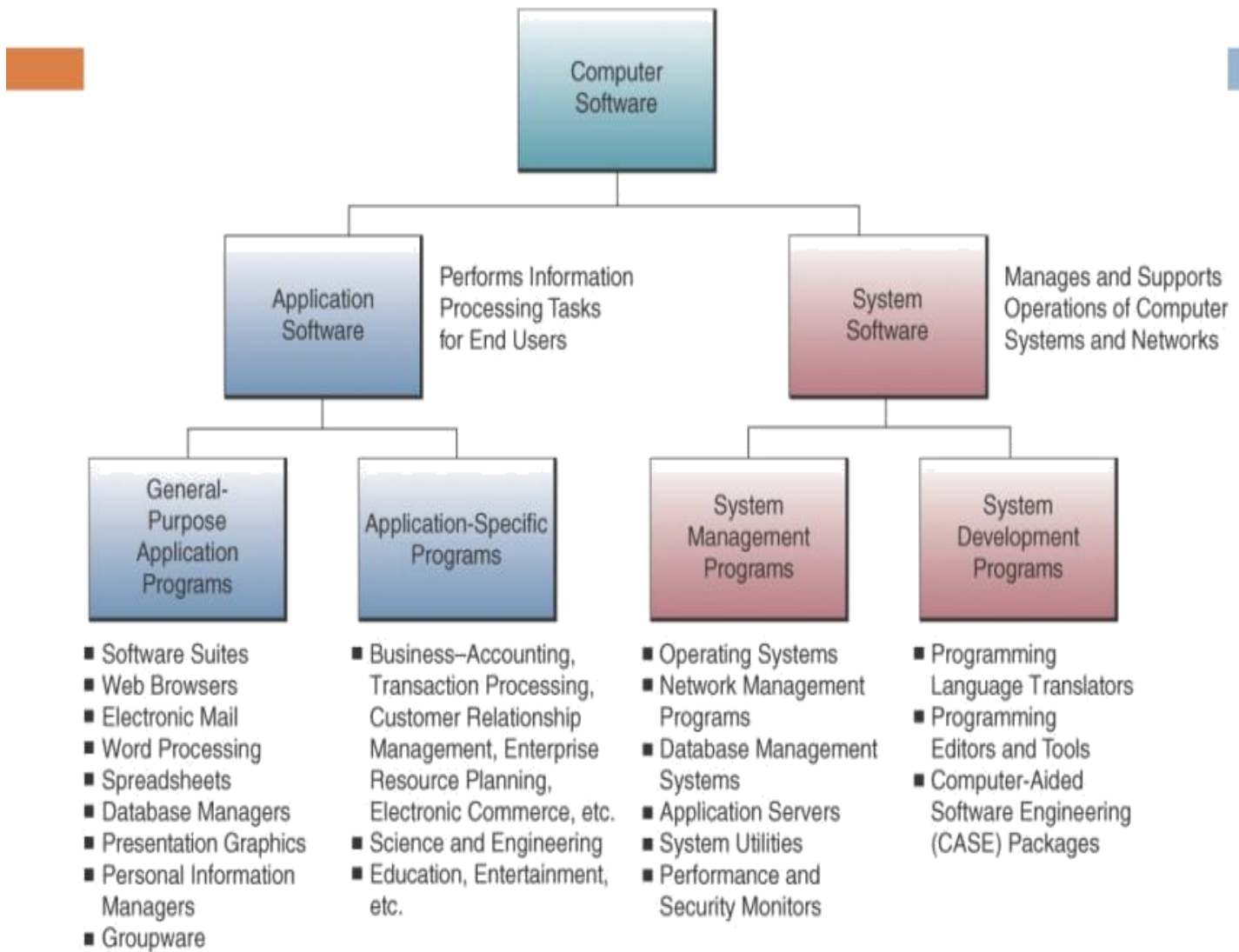


Figure 3.7 computer software

### 3.4.1 System software

It is a program that manage and support a computer system and its information processing activities are system software. These programs serve as a vital software interface between computer system and hardware and application programs of end users. This Programs can be classified in to two broad categories: System management programs and system development programs.

**Systems management programs:**Systems management programs are programs that manage the hardware, software, network, and data resources of the computer system during its execution of the various information processing jobs of the users. Examples of system management programs include operating systems, network management programs, and data base management programs.

**Systems development programs:** Systems development programs are programs that help end users develop information system programs and procedures and prepare user programs for computer processing. Examples include programming language translators and editors, other programming tools, and computer aided software engineering (CASE).

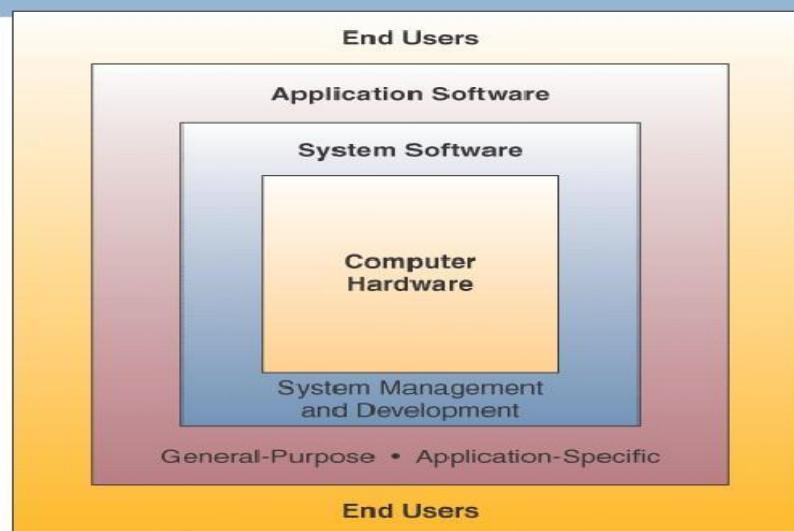


Figure 3.8 software components

### 3.4.1.1 Operating systems

The most important system software package for any computer is operating system. It is an integrated system of programs that manages the operations of CPU, control the input output and storage resources, and activities of the computer system, and provide various support services as the computer executes the application programs of users. The primary purpose of operating system is to maximize the productivity of computer system by operating it in a most efficient manner. It minimizes the amount of human intervention required during processing. It helps your application program performs perform common operations such as accessing the network, entering data, saving and retrieving files and printing and displaying outputs.

### 3.4.1.2 Functions of operating system

Operating system performs basic functions: provide user interface, resource management, task management, file management, utilities & support services.

1. **User interface:**User interface is the part of operating system that allows you to communicate with it so you can load programs, access files, and accomplish other tasks. The three main types of user interface are menu driven, command driven and graphical user interface (GUI). The trend in user interface is a way from command driven interface and even from menu driven interface to graphical user interface which is an easy to use interface that uses icons, bars, buttons, boxes or other images. GUIs rely on pointing devices like the electronic mouse, or track ball to make selections.
2. **Resource management:**The operating system allocates resources to the application jobs in an execution queue. It provides locations in primary memory for data and programs and controls the input and the output devices such as printers, terminals and telecommunication links.
3. **Task management:**The task management programs of an operating system manage the accomplishment of the computing task of end users. They give each task a slice of a CPU's time and interrupt the CPU's operation to substitute other tasks. Task management may involve a multitasking capability where several computing tasks can occur at the same time.

Multitasking may take the form of multiprogramming which permits multiple programs to share a computer system's resource at one time through concurrent use of a CPU. Multitasking may also take the form of time sharing where the computing tasks of several users can be processed at the same time.

4. **File Management:**An operating system contains file management program that control the creation, deletion and access of files of data and program. File management also involves keeping track of the physical location of files on magnetic disks and other secondary storage devices. Operating system maintains directories of information about location and characteristics of files stored on a computer system's secondary storage devices.
5. **Network management programs:**Today's information system relies heavily on the Internet, intranets, extranets, local area networks, and other telecommunications networks to interconnect end user workstations, network servers, and other computer systems. this requires a variety of system software for network management, including network operating system, network performance monitors, telecommunication monitors, and soon. These programs are used by network to manage network performance.
6. **Database management systems:** Database management system is considered an important system software package that controls the development, use and maintenance of database of a compute using organization. A database management system helps organizations use their integrated collections of data records and files known as databases. It allows different user application programs to easily access the same database. A database management system also simplifies the process of retrieving information from displays and reports. Instead of having to write a computer program to extract information, end users can ask simple questions in query language.
7. **Other system development programs:** Several other types of system management software are marketed as separate programs or are included as part of an operating system. Utility programs or utilities are one example. Other examples of system support programs include performance monitors and security monitors. Performance monitors are programs that monitor and adjust the performance and usage of one or more computer system to keep them running efficiently. Security monitors are packages that monitor and control the use of computer resources.

### 3.4.1.3 Programming languages

To understand computer software, you need a basic knowledge of the role the programming language plays in the development of a computer programs. A programming language allows a programmer to develop the sets of instructions that constitute a computer program. Many different programming languages have been developed, each with its own unique vocabulary, grammar and uses.

- A. Machine language:** Machine Language is the most basic level programming language. All program instructions had to be written using binary codes unique to each computer. It involves difficult task of writing instructions in a form of binary digit. Programmers need detailed knowledge of the internal operations of the specific types of Central processing unit. It requires specifying the storage locations for every instructions and item of data used. It is difficult and error prone.
- B. Assembly Language (Second Generation Language):** They are the next level of programming language. They were developed to reduce the difficulties in writing machine language programs. The use of assembler languages requires language translator programs called assemblers that allow a computer to convert the instructions of such language in to machine instructions. Assemblers are often called symbolic languages because symbols are used to represent operation codes and storage locations. It uses mnemonics (memory aids).
- C. High level Languages (3<sup>rd</sup> Generation Language):** High level language uses instructions which are called statements that uses brief statement or arithmetic expressions. These statements are actually macroinstructions; each individual statement generates several machine instructions when translated in to machine language by high level language translator programs called compilers or interpreters.
- D. 4<sup>th</sup> Generation Language:** Fourth generation language is More non procedural and conversational. Encourage users and programmers to specify the results they want while the computer determines the sequence of instructions that will accomplish those results. They are very close to English or other human language (natural Language)

### 3.4.1.4 Translators

Translators are Programs that translate other programs in machine language instruction codes that computers can execute. Other programming language editors are called programming tools

because they help programmers write program by providing a variety of program creation and capabilities.

### Language translators (Language processors)

**An assembler** translates symbolic instruction codes written in an assembler language to machine language. **Compiler** translates high level programming language statements. **An interpreter** is special type compiler. It translates and executes each statement in a program one at a time.

### 3.4.2 Application software for end users

Complete, self-contained computer program that perform a specific useful task. Thousands of application specific software packages are available to support specific application of end users in business and other fields. They are sometimes called productivity packages due to their ability to increase end user's productivity.

Example

- ◆ Transaction processing
- ◆ Decision support systems
- ◆ Accounting
- ◆ Sales management
- ◆ Investment analysis
- ◆ Electronic Commerce

### General Purpose Application

General purpose application programs that perform common information processing jobs for end users

- ◆ Word processing
- ◆ Spread sheet programs
- ◆ Database management programs
- ◆ Graphic programs
- ◆ Web browsers
- ◆ Electronic mail
- ◆ GroupWare

1. Associate the human brain with parts of human body and software with hardware apparatuses of computer?-----  
-----

### 3.5 Database Management

This part deals with managerial and organizational requirements and technologies for managing data resource. Organizations need to manage their data asset very carefully to make sure that they can be easily accessed by managers and employees across the organization.

An effective information system provides users with timely, accurate and relevant information. This information is stored in computer files. When the files are properly arranged and maintained, users can easily access and retrieve the information they need.

Data are pieces of information that represent the qualitative or quantitative attributes of a variable or set of variables. Data (plural of "datum") are typically the results of measurements and can be the basis of graphs, images, or observations of a set of variables. Data are often viewed as the lowest level of abstraction from which information and knowledge are derived. Data is vital organizational resource that needs to be managed. The data can be about internal operations or external environment.

#### 3.5.1 Foundation of data concepts

Data may be logically organized in to characters, fields, records, files, and database

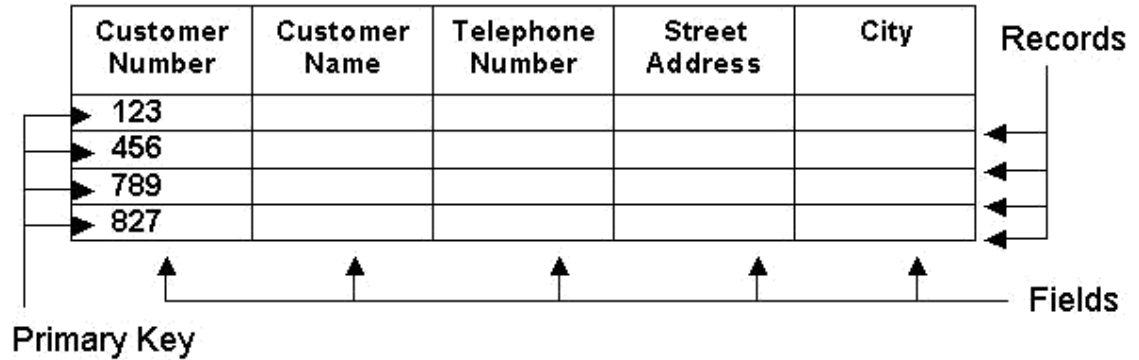
**Character:** The most basic logical data element. It Consists single alphabetic, numeric or another symbol.

**Field:** next higher-level groupings of characters. Example: Name field

Represents an attribute (characteristics, quality) of an entity, object, person, place or event.

**Record:** groups of related fields

Represents a collection of an attribute representing an entity fixed length record contains fixed length of data field variable length record contains a variable  $\neq$  of fields & field length.



### File

File is a group of related records, table

### **Database**

An integrated collection of logically related objects records.

#### **3.5.2 Problems with traditional file environment**

Most organizations began information processing on small scale, automating one application at a time. Systems tend to grow independently and not according to grand plan. Each functional area tends to develop information system in isolation from other functional areas. Accounting, finance, manufacturing, human resources, and marketing all develop their own systems and data files.

Each application required its own files and its own computer program to operate. For example, the human resource functional area might have a personnel master file, a payroll file, a medical insurance file, a pension file, a mailing list file, and so forth. This process leads to creating, maintaining and operating multiple master files.

#### **3.5.3 Database management software**

DBMS is a set of computer programs that control the creation, maintenance and use of databases of an organization and its end users.

#### Major uses of DBM

##### a) Data base development

Some database management systems allow end-users to easily develop the data base they need example access & lotus.

Large organizations with client /server or mainframe - based systems usually place control of enterprise wide database development in the hands of database administration and other database specialists

Data base developers use the data definition language in database management system to develop and specify the data contents, Relationships, and structure of each data base, and to modify those database specifications when necessary. Such information is catalogued and spaced in database of data definition and specifications called a data dictionary. Data dictionary is another tool of database administration. It is a computer-based dictionary containing metadata-Data about data.

It contains software components to manage a data base of data definition that is metadata about the structure, data elements, and other characteristics of organizations data base.

b) Database interrogation

Database Interrogation is Use of query language or a report generator to ask for information.

SQL (structured query language) →

Found in many databases management perhaps.

Select	from	where
Data fields You want to retrieve	files and tables from which you want the data	conditions that limit the search to only those date records in which You are interested

Query by example (QBE)

Query by example is Point and click capability to make it easier to end users.

c) Data base maintenance

The database of an organization needs to be updated continually to reflect new business transactions and other events.

Data maintenance is done by transition processing programs & other and user applications.

d) Application development

The use of 4 GL and built in software development tools to develop custom application programs. Example- Data entry screens, forms, reports, web pages.

### **2.5.4 Types of databases**

Continuing development in information technology and its business application have resulted in evolution of several major types of databases. The following are major conceptual categories of databases that may be found in many organizations.

i) Operational database

These databases store detailed data needed to support the business processes and operations of business enterprises. Store detailed data needed to support the operations of the entire organization.

They are also called subject area database, transaction, production data bases.

ii) Analytical databases store data and information extracted from operational and external databases.

Summarized data & information most needed by managers & other end users. Also called management databases / information databases are called multidimensional database since they frequently use a multidimensional database structure.

iii) Data warehouse

Store data from current and previous years that has been extracted from the various operational databases of an organization

iv) Distributed database

Many organizations replicate and distribute copies of or parts of databases to network servers at a variety of sites. Such a distributed database is termed distributed database

v) End-user database

A variety of data files developed by end user at their workstations

vi) External database

Access to wealth of information from external sources (world-wide webs)

### Benefits and limitations of database management software

Advantage

Reduces duplication of  
data Integrates data  
Increase integrity and security of data

Disadvantage

Difficulty and cost of installing  
Centralized data bases errors frond, and  
failures Decentralized database inconsistency

### **2.5.5 Managerial consideration for data resource management**

Database management is a very important application of information system technology to the management of firm's data resources.

Develop and enforce policies governing data ownership & access  
control. Conduct organizational data resource requirement planning

Develop an organizational data model & data structure

Prepare strategic and technical database plans

Identify opportunity for data sharing and potential database  
application Set procedure for data retention

Set and enforce procedure for standard

Conduct physical database design

Conduct logical database design

Conduct data base tuning & capacity planning

Establish & maintain data dictionary

Evaluate & select database hardware and software

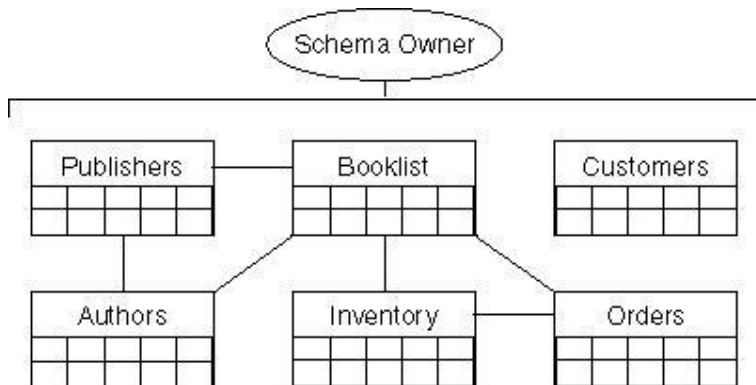
### **3.5.6 The Elements of a Database**

#### **3.5.6.1 *Table***

***Table*** is the primary unit of physical storage for data in a database. When a user accesses the database, a table is usually referenced for the desired data. Multiple tables might comprise a database; therefore, a relationship might exist between tables. Because tables store data, a table requires physical storage on the host computer for the database.

The following figure illustrates tables in a schema. Each table in the figure is related to at least one other table. Some tables are related to multiple tables.

Figure 3.9 -Database tables and their relationships.



Four types of tables are commonly used:

**Data tables** store most of the data found in a database.

**Join tables** are tables used to create a relationship between two tables that would otherwise be unrelated.

**Subset tables** contain a subset of data from a data table.

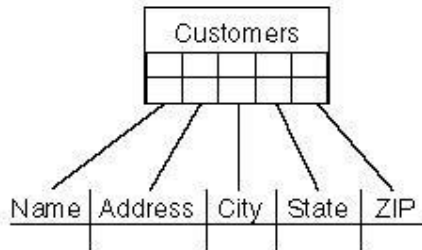
**Validation tables**, often referred to as code tables, are used to validate data entered into other database tables.

Tables are used to store the data that the user needs to access. Tables might also have constraints attached to them, which control the data allowed to be entered into the table. An entity from the business model is eventually converted into a database table.

**column**, or *field*, is a specific category of information that exists in a table. A column is to a table what an attribute is to an entity. In other words, when a business model is converted into a database model, **entities become tables** and **attributes become columns**. A column represents one related part of a table and is the smallest logical structure of storage in a database. Each column in a table is assigned a data type. The assigned data type determines what type of values that can populate a column. When visualizing a table, a column is a vertical structure in the table that contains values for every row of data associated with a particular column.

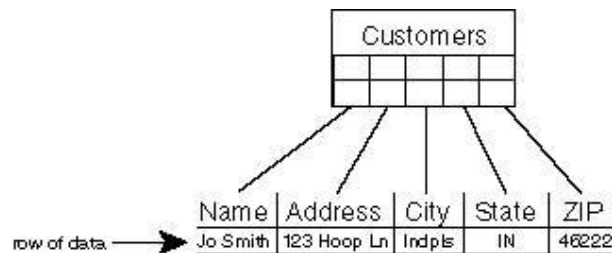
In Figure below, columns within the Customers table are shown. Each column is a specific category of information. All of the data in a table associated with a field is called a column.

Figure 3.10 -Columns in a database table.



A **row** of data is the collection of all the columns in a table associated with a single occurrence. Simply speaking, a row of data is a single record in a table. For example, if there are 25,000 book titles with which a bookstore deals, there will be 25,000 records, or rows of data, in the book titles table once the table is populated. The number of rows within the table will obviously change as books' titles are added and removed. See Figure below for an illustration of a row of data in a table.

Figure 3.11- Row of data in a database table.



### 3.5.6.2 Data Types

A *data* type determines the type of data that can be stored in a database column. Although many data types are available, three of the most commonly used data types are Alphanumeric, Numeric, Date and time. *Alphanumeric* data types are used to store characters, numbers, special characters, or nearly any combination. If a numeric value is stored in an alphanumeric field, the value is treated as a character, not a number. In other words, you should not attempt to perform arithmetic functions on numeric values stored in alphanumeric fields. Design techniques such as this will be discussed in more detail throughout the book. *Numeric* data types are used to store only numeric

values. *Date and time* data types are used to store date and time values, which widely vary depending on the relational database management system (RDBMS) being used.

### 3.5.6.3 Keys

The integrity of the information stored in a database is controlled by keys. A *key* is a column value in a table that is used to either uniquely identify a row of data in a table, or establish a relationship with another table. A key is normally correlated with one column in table, although it might be associated with multiple columns. There are two types of keys: primary and foreign:

**Primary Keys:** is the combination of one or more column values in a table that make a row of data unique within the table. Primary keys are typically used to join related tables. Even if a table has no child table, a primary key can be used to disallow the entry of duplicate records into a table. For example, an employee's social security number is sometimes considered a primary key candidate because all SSNs are unique.

**Foreign Keys:** is the combination of one or more column values in a table that reference a primary key in another table. Foreign keys are defined in child tables. A foreign key ensures that a parent record has been created before a child record. Conversely, a foreign key also ensures that the child record is deleted before the parent record.

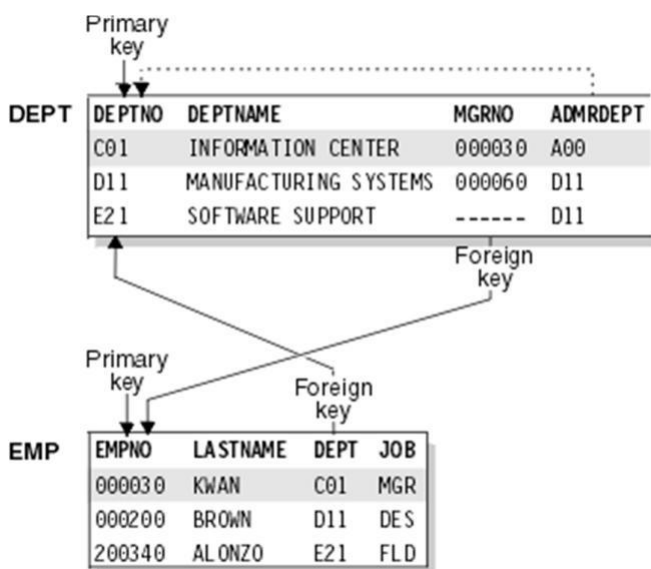


Figure 12- *Referential integrity, or parent/child relationships.*

#### **3.5.6.4 Relationships**

Most databases are divided into many tables, most of which are related to one another. In most modern databases, such as the relational database, relationships are established through the use of primary and foreign keys. The purpose of separating data into tables and establishing table relationships is to reduce data redundancy. The process of reducing data redundancy in a relational database is called *normalization*.

Three types of table relationships that can be derived are as follows:

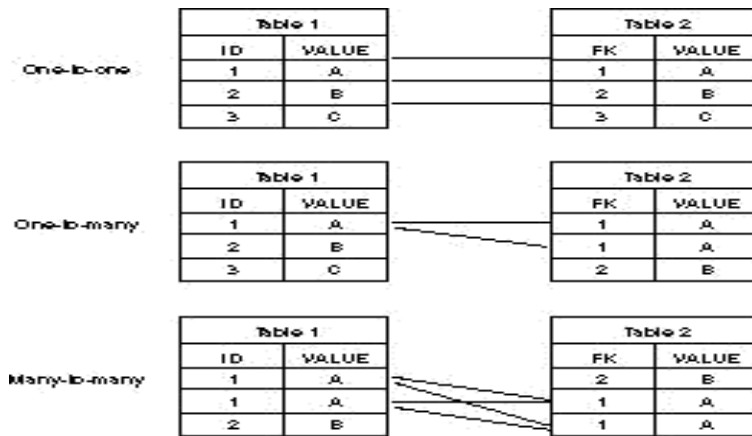
One-to-one--One record in a table is related to only one record in another table.

One-to-many--One record in a table can be related to many records in another table.

Many-to-many--One record in a table can be related to one or more records in another table, and one or more records in the second table can be related to one or more records in the first table.

The following Figure briefly illustrates table relationships in a relational database. A relational database allows parent tables to have many child tables, and child tables to have many parent tables. The figure shows two tables. Table 1 has an ID column (primary key) and Table 2 has an FK column (foreign key). In the one-to-one relationship example, notice that for every ID in Table 1, there is only one ID in Table 2. In the one-to-many relationships example, notice that the ID of 1 has many occurrences in Table 2. In the many-to-many relationship example, notice that the ID in Table 1 might occur multiple times in Table 2 as a foreign key, and the ID in Table 2 might occur multiple times in Table 1.

Figure 13- *Available table relationships in the relational model.*



### 3.6 Communication Technologies

Currently one of the prominent communication technologies is telecommunications, which is essential to today's smooth business operations, is the transmittal of data and information from one point to another. The Greek word *tele*, which means "distance," is part of such words as "telegraph," "telephone," and other words referring to technologies that allow communications over large distances. Thus, telecommunications are communications over a distance. Telephone, fax, e-mail, the World Wide Web—none of these essential business services would be available without fast, reliable telecommunications. In fact, electronic commerce, popularly called "e-commerce," would be impossible.

#### 3.6.1 Business importance of communication technologies

**Better business communication:** When no physical objects need to be transferred from one place to another, telecommunications technology can make geographical distance irrelevant. E-mail, voice mail, faxing, file transfer, cellular telephony, and teleconferencing enable detailed and instant communication, whether among managers, between managers and their staffs, or among different organizations. Telecommunications can also be used by one person to monitor another person's performance in real time. Telecommunications are used to communicate directions and receive feedback without requiring people coordinate their schedules to hold a meeting. And the use of e-mail has brought some secondary benefits to business communications by establishing a permanent written record of, and accountability for, ideas. The result is more accurate business communications.

**Higher efficiency:** Telecommunications has made business processes more efficient. Many business processes are serial in nature: one department must have the input of another department before acting and must then produce its own information, which in turn serves as input for a third department, and so on. For example, when the sales department receives a purchase order from a customer, it must communicate the order to the warehouse, which needs the information to prepare the package. The warehouse workers must then forward shipping documents to the accounts receivable department for billing. With telecommunications, all documents can be accessed electronically by many different departments at the same time. Furthermore, processes that used to take a long time for action and counteraction by two or more parties can now be carried out in one session attended by all parties involved, through telecommunication lines.

**Better distribution of data:** Organizations that can transmit vital data quickly from one computer to another no longer need centralized databases. Business units that need certain data frequently may store it locally, while others can access it remotely. Only fast, reliable transfer of data makes this efficient arrangement possible.

**Instant transactions:** The availability of the Internet to millions of businesses and consumers has shifted a significant volume of business transactions to the Web. Both businesses and consumers can shop, purchase, and pay instantly online. In addition to commercial activities, people can use telecommunications for online education and entertainment

As a professional, you will be responsible for ensuring that your organization maximizes its benefits from fast and reliable telecommunications. To do so, you may be involved in selecting a telecommunications system or in exploring the demands on your organization's system. To be a creative and productive contributor to these key decisions, it is essential that you grasp the basic technology behind telecommunications.

At the same time, you enjoy the great opportunities created by telecommunications technology, you must recognize that it poses great risks. Once an organi-

zation connects its Information Systems to a public network, security issues become extremely important. Unauthorized access and data destruction are constant threats. Thus, organizations must establish proper security controls as preventive measures. Security issues have become especially important due to the popularity of the Internet and its growing accessibility.

### **3.6.2 Uses of telecommunication technologies**

**Cellular phones:** is derive their name from the territories of service providers, which are divided into areas known as cells. Each cell has at its center a computerized transceiver, because it both transmits signals to another receiver and receives signals from another transmitter. When a call is placed on a cellular phone, the signal is first transmitted to the closest transceiver, which sends a signal that dials the desired phone f the receiving telephone is not in the same cell as the sending phone, a series of transceivers receive and retransmit the message until it reaches the destination phone. Communication takes place between the cellular phone and the receiving party through the transceivers. As the user moves from one area, or cell, to another, other transceivers pick up the transmission and receiving tasks.

Millions of people use cellular phones. As long as a cellular service is available, people can transmit and receive calls anywhere, freeing them from a fixed office location. Cellular phones can also be used for e-mail and faxing, and some are designed to enable use of the Web. "My car is my office" is a reality for many managers who spend much of their time traveling. As technology advances, you will soon be able to say "My pocket is my office."

**Videoconferencing:**In the past, when managers from two remote sites wanted to confer in person, they had to travel to a meeting place. Now, people sitting in conference rooms thousands of miles apart are brought together by their transmitted images and speech in what is called videoconferencing.

Video conferencing saves travel costs and the time of highly salaried employees, whether they work in different organizations or in different sites of the same organization. From national and global perspectives, videoconferencing also reduces traffic congestion and air pollution. Companies save much time and money with the technology.

**Voice mail:** Virtually every personal computer can be equipped with hardware and software that allows its user to transmit and receive voice mail. Many PCs are sold with the appropriate software already installed. Everyone is familiar with the basic idea of voice mail. With PC-based voice mail, a telephone line is connected to a modem, which in turn is connected to a Pc. When a person calls the line and leaves a voice message, the message is translated into bytes and stored on the Pc. Then, the voice mail file can be retrieved and played through the PC's speakers. Alternatively, the voice-mail file can be accessed by calling the PC again and listening to the stored message over the phone. Voice mail has largely replaced answering machines in the business environment. Digitized messages are significantly clearer than those recorded on tape.

**Facsimile:** Facsimile (from the Latin word for duplicate), or fax, is the transmission and reception of images over telephone lines. A fax machine digitizes an image and transmits the representative bits to a receiving fax machine. The receiving machine converts the digitized codes back into an image. The great advantage of using fax machines is their ability to transmit original documents, both text and images, without first converting them into a computer file. Fax machines also provide an easy means of communicating graphical images.

**Information kiosks:** Many businesses have placed information kiosks in their showrooms so prospective customers can serve themselves. The kiosks provide touch screens linked to databases through communication lines. Customers can retrieve textual, pictorial, and animated information. This not only lets them receive more information about products, but also saves much labor for the companies.

**Pay at the pump:** An increasing number of drivers never approach a cash register when paying for the fuel they purchase at gasoline stations. They use credit cards and speed payment devices. You may have noticed the antenna dishes on the rooftops of gas stations. When you use one of these payment devices, an information system checks your credit through a communication link in a large database located hundreds or even thousands of miles away and operated by the bank authorizing the charge.

**Web-based electronic commerce:**Fast digital communication enables millions of organizations to conduct business using the Web. Whole industries, such as online exchanges and auctions, have been created thanks to the Web. Some technologies, such as electronic data interchange, are migrating to the Web.

**Worldwide peer-to-peer file sharing:**One of the most interesting developments in worldwide telecommunications is **peer-to-peer (P2P) file sharing** through the Internet: anyone with access to the Internet can download one of several free applications that help locate and download files from any online computer. You might have heard the names of others. While the concept has served well scientists who share scientific text files and application developers who exchange code, the greater use has been in downloading artistic files, such as music and video files. Because unauthorized duplication and use of such files violates copyright laws and deprives recording and film companies and artists of revenue, these industries have tried to fight such technologies, with limited success.

**Data communications:** is any transfer of data within a computer, between a computer and another device, or between two computers. For a computer to function, binary data in the form of electrical impulses must flow from one component to another, such as from the CPU to memory, from the CPU to the monitor, or from memory to the hard disk. This type of communication is accomplished through the computer's bus. A **bus** is a system of wires, or strings of conductive material, etched on the surface of a computer board. It is a communications channel that allows the transmission of a whole byte or more in one pass.

Telecommunications is communication of data between two devices over a distance. This discussion refers to telecommunication among computers or between computers and other digital devices. The data may represent any number of media, including voice, video, animation, or text. Once communications are transmitted between computer systems rather than within a single system, the rules of the communications game become more complex. A number of questions about how to manage communications arise, such as:

What physical channels should be used to transmit and receive signals?

How can we maximize communication speed per dollar spent on communication links?

What is the best layout of the nodes in an internal network for your business?

How do you keep your data resources and information secure?

Other issues must be taken into account when considering a telecommunications system. For instance, communications devices must be compatible. As always, the benefits of the

### **2.6.3 Communication Direction**

The three modes of communication between devices-simplex, half-duplex, and full-duplex-are distinguished by whether communication travels one way in one direction, one way at a time in two directions, or two ways. In fact, a single line may support the transmission of two devices one to another simultaneously.

#### **Simplex**

In **simplex** communication, device A can transmit to device B, but device B cannot transmit to device A. An example of simplex communication is commercial radio transmission. Your car radio can receive signals from a radio station, but cannot transmit back to it.

#### **Half-duplex**

In **half-duplex** mode, device A can transmit to device B while device B receives the signal. Device B can transmit to device A while device A receives the signal. However, the two devices cannot transmit to each other simultaneously, and one device can transmit to the other only when the other device is in reception mode. One example of half-duplex is CB (citizens band) communication. Half Duplex may also take place when you use a computer terminal to communicate with a mainframe computer.

## **Full-duplex**

In **full-duplex** communication, either device can transmit to the other device while simultaneously receiving signals from the other device. That is, device A can transmit to B and receive from B at the same time, and vice versa. Telephony is an example of full-duplex: both parties can talk and listen at once (although this method is neither a practical nor a polite way to use the telephone). Full-duplex data communication is often used between computers.

### **3.6.4 Communication medium**

A communications medium is the physical medium, such as telephone lines or television cables, through which data can be communicated. The capacity of the medium is the speed at which data are communicated, which is also called the **transmission rate** (1 Kbps is actually 1024 bps and 1 Gbps is actually 1,048,576 bps.) It is often called "bandwidth." **Bandwidth** is measured in **bits per second (bps)**; the greater the capacity, the faster the transmission. As is often the case, communications speed is a limited resource. The greater the speed, the higher the cost of the communications line. (Professionals say, "The wider the band, the more expensive the line.") Thus, determining the type of communications lines to install or subscribe to is an important business decision.

#### *Transmission speed measurement units*

bps	= Bits per second
Kbps	= Thousand bps
Mbps	= Million bps (mega bps)
Gbps	= Billion bps (giga bps)
Tbps	= Trillion bps (tera bps)

#### **Bandwidth**

When the communication line affords only low speed, it is said to be **narrowband**. When a line has great capacity and can carry many streams of data simultaneously (and thus the total transmission is faster), it is said to be

**broadband.** For example, copper wire telephone lines are a narrowband medium that cannot transmit effectively at speeds of more than 56,000 bps and, even at this speed, only for short distances, unless special software is used. Other specially treated, or "conditioned," telephone lines can handle greater capacities. Of course, you can force your computer to deliver signals into the line at a higher rate, but the destination receives a garbled message.

A medium is anything through which bits are transmitted. Media do not have to be tangible as wires and cables. An unguided medium, air (which has no physical channel), carried the second transmission. Another example of unguided media is outer space. Unguided media allow wireless telecommunications, which is so important for businesspeople outside the office; however, as you will see later, it is also useful in computer networks inside offices. In air and space, a carrier such as radio waves or light must be used to carry the signal. Thus, although we may refer to microwaves or light as media, they are actually the carriers of the signal, not the media.

#### **3.6.4.1 Transmission Speeds**

A medium's capacity is determined by the maximum number of bits per second that it can carry. You should remember that the number of signals per second is not always equal to the number of bits per second. Sometimes one signal can represent two or more bits. The number of signals per second is called baud. If the baud rate is 28,800 and each signal represents two bits, then the bps rate is 57,600. In referring to speed, it is better to use bits per second (bps), not baud.

There are different media-including twisted pair, coaxial cable, and optical fibers-vary in a number of ways: how much information they can carry, what their vulnerability to corrupting interference is, what they cost, whether they guide the data, and how readily available they are.

#### **Twisted pair**

The most pervasive and commonly available communications network is the telephone network. Telephones are connected either directly to a local telephone company office or to a local private branch exchange (PBX), which is connected

to a telephone company office. A traditional telephone line is made of a pair of twisted copper wires that acts as a single communications link. The wires are twisted to reduce electromagnetic interference (EMI), which can alter voice and data and make them unclear. Used only between the telephone jack and the central office of the company providing the telephone service. The typical distance of this link is one to four miles, and is often referred to as "the last mile." The network connecting the central offices themselves is made of optical fibers. Even the short link between the central office buildings that have been constructed in recent years is no longer copper wires, but optical fibers.

When twisted pairs are used for local area networks supporting personal computers, the transmission rate may reach 100 Mbps (one million bits per second). The last mile of copper wires can be enabled to transmit digital signals at speeds up to 8 Mbps with special equipment and software both at the telephone company's central office and at the subscriber's end. The service is called digital subscriber line (DSL) and is provided by telecommunication companies both to businesses and households. DSL enables high-speed connection to the Internet.

### **Coaxial cable**

Coaxial cable is sometimes called TV cable or simply "cable" because of its common use for cable television transmission. Like telephone lines, it is made of two conductors, but it is constructed differently to permit operation over a wider range of frequencies. It consists of a hollow outer conductor and an inner wire conductor, with a plastic insulator between them. The outer conductor is covered with PVC, a special plastic.

Coaxial cable is more expensive than twisted pair, but its transmission rate is greater. Thanks to its shielded concentric construction, coaxial cable is much less susceptible to EMI (*electromagnetic interference*). In voice communication, it is less prone to crosstalk (the intrusion of a third party's conversation on your line) than twisted pair.

## **Microwaves**

Microwaves are high-frequency radio waves with a short wavelength. Shortwave radio frequencies can carry signals over long distances with high accuracy. Radio Frequency uses different waves to represent bits. You have probably not the ubiquitous parabolic antennas on the roofs of buildings. They are so numerous on roof tops and high antenna towers because microwave communication is effective only if the line of sight between the transmitter and receiver. Clusters of microwave antennas are often installed on high buildings and the tops of mountains to obtain a clear line of sight. There are many types of microwaves such as

**Terrestrial Microwave:** Microwave communication requires far fewer repeaters and amplifiers than the coaxial cable and optical fibers, for the same distance. It is commonly used for voice and television communications.

**Satellite Microwave:** Signals can also be transmitted using microwaves via satellite links. There are two major types of satellites: **geostationary**, also called GEO, and **low earth orbit** also called LEO. Both types serve as radio relay stations in orbit above the earth that receive, amplify, and redirect signals. Microwave transceiver (transmitter receiver) dishes are aimed at the satellite, which has antennas, amplifiers, and transmitters. The satellite receives a signal, amplifies it, and retransmits it to the destination.

Communications satellites are launched not only by private enterprises, but also by national governments. The satellites are used for television broadcasts, long-distance telephone transmissions, and private business networks. A satellite owner can divide the frequency (that is, the band) into several channels and lease different channels to different users. Large companies, such as Kmart and Wal-Mart, have leased satellite channels. They use the links to transmit business data quickly among stores and distribution centers.

Because of the great distance from earth to satellites, the communication is fine for transmitting data because delays of a few seconds make no significant difference. However, a delay of even two or three seconds may be disturbing in interactive communication, such as when voice and pictures are communicated in

real time. You might have noticed such delays when reporters use devices that communicate to a television station. When an anchorperson asks a question, the reporter on location receives the question with a noticeable delay.

**Optical fiber:** Fiber-optic technology uses light instead of electricity to represent bits. Fiber optic lines are made of thin fiberglass filaments. A transmitter sends bursts of light using a laser or a light-emitting diode device. The receiver detects the light and samples the line to receive the data bits. Optical-fiber systems operate in the infrared and visible light frequencies. Because light is not susceptible to EMI (electromagnetic interference) and RFI (radio frequency interference), fiber optic communication is much less prone to error than twisted pair and radio transmission.

Optical carrier (OC) fibers compare favorably with coaxial cable networks in providing a fast, reliable medium for telecommunications. As a result, they are rapidly replacing both twisted-pair and coaxial cable telephone lines. Optical fibers surpassed satellites as the dominant means for global digital network communications. Expanding fiber-optic networks and their declining prices offer great opportunities for businesses

### **3.6.5 Modulation**

Modulation is nothing but, a carrier signal that varies in accordance with the message signal. Modulation technique is used to change the signal characteristics. Basically, the modulation is of following two types: Analog and digital modulation.

Ideally, data communications should be transmitted over a line that can carry a digital signal. If the line can carry only analog signals, the digital signals must be translated into equivalent analog signals as they pass from the computer to the analog line and then they must be translated back to the original digital signals just before they are transferred to the receiving computer. This modification of a digital signal (from the computer) into an analog signal (for the phone line to transmit) is called **modulation**. The transformation of an analog signal (from the phone line) into a digital signal (so the computer can understand it) is called **demodulation**.

There are three different types of modulation: amplitude modulation, frequency

modulation, and phase modulation.

**Amplitude modulation:** An analog signal can be graphically represented as a continuous series of waves of different heights. The height of the wave is its amplitude. Amplitude modulation (AM) uses differences in amplitude to express digital signals.

**Frequency modulation:** In frequency modulation (FM), the amplitude of the wave remains constant, but variations in frequency are used to represent digital signals. Frequency is the number of waves per second. Whenever a 0 bit is transmitted, the frequency is low. Whenever a 1 bit is transmitted, the frequency is higher. The two frequencies represent the 0s and 1s.

**Phase modulation:** in phase modulation, transmission always starts with a certain bit, 0 or 1. When the wave abruptly stops and immediately continues at another phase, it indicates a shift from the previously transmitted bit to the other bit, such as from 0 to 1 or from 1 to 0.

### **3.6.6 Modems and their capabilities**

A **modem** is a word contracted from modulator-demodulator-is a device whose purpose is to modulate and demodulate communications signals. A modem can be internal (plugged into the computer's motherboard) or external (outside the computer, plugged into a serial port or a universal serial bus port). To use a modem, the user needs to attach it to a computer and use communications software, which is part of today's operating systems.

To connect your computer to the Internet you need some sort of modem, with the four primary alternatives being a telephone modem, DSL modem, cable modem, and satellite modem. Each of these is a telecommunications device that allows you to connect your computer to another computer or to a network of other computers. For surfing the Web, this "network of other computers" is in fact the Internet.

A **telephone modem** is a telecommunications device that connects your computer through a phone line to a network of other computers. A telephone modem is the slowest type of modem, with speeds up to 56 Kbps (56 thousand bits per second). Telephone modems also tie up the use of your telephone line.

So, for example, you can't receive incoming phone calls if you're surfing the Web. You can, of course, get a second telephone line, but that creates additional cost. Telephone modems come standard on all desktop and notebook computers.

A **DSL** (Digital Subscriber Line) modem is a high-speed telecommunications device using a phone line, which allows you to use your phone line for voice communication at the same time. With speeds up to 100 times faster than a telephone modem, a DSL modem provides you with an "always-on" Internet connection giving you instant access without having to dial in.

A **cable modem** is a telecommunications device that uses your TV cable to produce an Internet connection. The speed of transmission with a cable modem is between 20 and 100 times faster than a telephone modem. A cable modem has similar advantages to a DSL modem: increased speed, an always-on connection, and the ability to surf the Web and watch cable TV simultaneously. But as with a DSL modem, whether or not you can actually use a cable modem is determined by whether your cable TV service can provide such a service. Finally, a satellite modem is a telecommunications device that allows you to get Internet access using a satellite dish. For this, you'll need the right type of antenna (i.e., satellite dish). Some cable TV providers now offer you a satellite dish that you can use both for receiving cable TV and accessing the Internet. Like DSL and cable modems, satellite modems are much faster than telephone modems and offer an always-on Internet connection.

**Fax/Voice:** Nowadays, all PC modems are fax modems, that is, they allow the computer to be used as a fax machine. First the modem "digitizes" any page that needs to be faxed. Digitization is a way of taking a picture of a page and relaying it as an array of dots. Special software divides the page into many tiny areas. Each area is assigned a binary code that represents its location on the page and its color, or hue. This digital code is then transmitted as a stream of bits. The receiving device transforms the digitized stream and reconstructs the picture.

To receive a fax through a fax modem, the receiving computer must be on. The received digitized page is saved in a file. Note that the fax is an image of the page. If a letter or other text is faxed, the digital file is not the ASCII code repre-

senting the characters; it is just a picture of the characters. As such, the file can-not be manipulated and edited with a word processor. Many modems also allow callers to leave voice messages, which are digitized and stored for later retrieval.

A fax modem can transmit to a fax machine or another fax modem only from a computer file. For example, you cannot transmit your picture via a fax modem unless the picture is in digital form on the computer. However, you can use a scanner to scan the picture, store the scanned version in a file, and fax the file via the fax modem.

### **3.6.7 Networks**

In the context of data communications, a network is a combination of devices or nodes (computers or communication devices on a network) connected to each other through one of the communication channels just discussed. Networks in which a single host computer serves only dumb terminals (computers with no processing capability of their own) are becoming obsolete as prices of microcom-puters have plummeted.

There are two basic types of networks: LANs (local area networks), which serve an office or several adjacent offices; and WANs (wide area networks), which are larger, national or global networks. Often, both types of networks use the same type of layout, also called topology, and the same types of protocols (sets of rules) for signal transmission and reception. In such cases, the only difference between LANs and WANs is the distance between the networked computers.

#### **Local Area Networks**

A computer network within a building, or a campus of adjacent buildings, is called a local area network, or LAN. No specific distance classifies a network as local, but usually as long as it is confined to a radius of three to four miles, it is called a LAN. LANs, which can be hardwired or wireless or a combination of the two, are the most common way to let users share software and hardware resources and to enhance communication among workers.

In LANs, one computer is often used as a central repository of programs and files that all connected computers can use; this computer is called a server.

Connected computers can store documents on their own disks or on the server, can share hardware such as printers, and can exchange e-mail.

In recent years the cost of wireless devices has decreased significantly, and many offices as well as households now network their computers wirelessly. Wireless LANs (WLANs) offer significant benefits: installation is much easier because you don't have to drill through walls to install wires, and you can move equipment wherever it is needed. Wireless networks offer significant savings in some environments. Wireless LANs are less costly to maintain when the network spans two or more buildings. They are also more scalable. Scalability is the ease of augmenting a system. It is relatively easy to add more nodes, or clients, to a wireless LAN.

However, wireless LANs have a significant drawback: they are less secure than wired LANs. On a wired network, there are several measures that may be taken to guard against unauthorized access; on a wireless network, there are security measures, but they are limited compared to those for wired networks, are not always easy to set up, and can slow down communications. To intrude on a wireless network, the intruder has to have the proper wireless network card installed in the computer and place the computer close enough to the network. Since wireless devices often cover a radius of 300 feet (about 100 meters), an intruder could park a car close to the office or home and use a laptop or hand-held computer to intercept communications.

Wireless LANs are useful especially in places where wires cannot be installed, or where the LAN is temporary. For example, it would be inconceivable to drill holes in historic buildings or in glass walls. Similarly, it is much more convenient to use wireless on construction sites, and in temporary outdoor exhibitions. Wireless LANs have gained great popularity in recent years.

### **Wide Area Networks**

A network that crosses organizational boundaries, or in the case of a multi-site organization, reaches outside the immediate environment of local offices and factory facilities, is called a wide area network (WAN). WANs can be public or private. The Internet is an example of a public WAN. A private WAN may use

either dedicated lines or Very Small Aperture Terminal (VSAT) satellites, which provide narrow bandwidths and are less expensive. Many organizations cannot afford to maintain a private WAN. They pay to use existing networks, which are provided in two basic formats: common carriers or value-added networks.

A common carrier provides public telephone lines that anyone can access or dial up, and leased lines, which are dedicated to the leasing organization's exclusive use. The user pays for public lines based on time used and distance called. Leased lines are dedicated to the leaseholder and have a lower error rate than dial-up lines, because they are not switched among many different subscribers.

Value-added networks (VANs) VANs fulfill organizational needs for reliable data communications while relieving the organization of the burden of providing its own network management and maintenance. Many businesses use VANs for their electronic data interchange (EDI) with other businesses, suppliers, and buyers. However, due to cost considerations, an increasing number of organizations prefer to conduct e-commerce via the Internet rather than through VANs.

### 3.6.7.1 Network topology

Network topology is the physical layout of nodes in a network, which often dictates the type of communications protocol used by the network. In reality, only small LANs use a single topology. Larger networks are usually a combination of two or more different topologies.

#### Star

In a star topology all nodes connect to one central device. That device may be a file server, a private branch exchange (PBX), or a network hub. When the user of a node wants to transmit to another node, the communication is

managed by, and transmitted through, the central device, which contains the communications software.

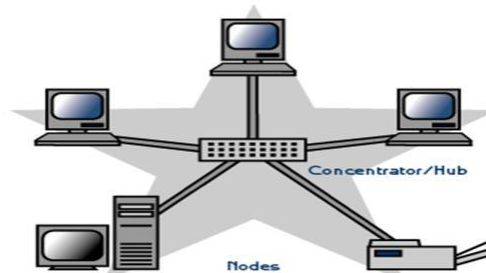


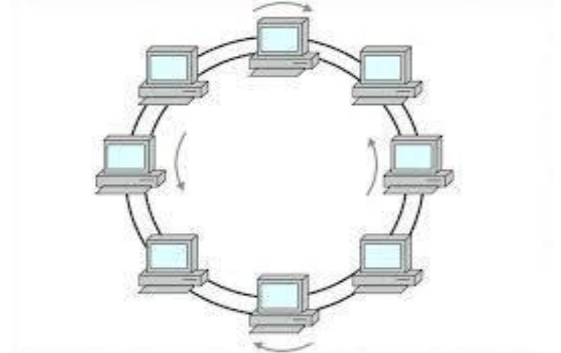
Figure 17: star topology

The advantage of star topology is that it is easy to determine the source of a

network problem, such as a cable failure. The main disadvantage of star topology is that if the central device is not working, the entire network is down. Another disadvantage is that adding computers can be costly, because each connected computer needs a cable to the central device. However, such networks can use wireless technologies, which eliminate the need for physical connections through cables.

## Ring

Ring topology is employed in LANs. Every node connects to two other nodes through a single line: a twisted-pair cable, a coaxial cable, or a fiber-optic cable. No central computer manages communication. Usually one computer with a large storage capacity is used as a server; however, it does not control the network. Signals flow in the ring in one direction. Each node filters signals that are addressed to it from all signals. If a token ring protocol is employed, a token, which is a special byte, travels around the ring until a node wishing to send a message seizes it, launches the message to the token, and then releases the token back into the ring.

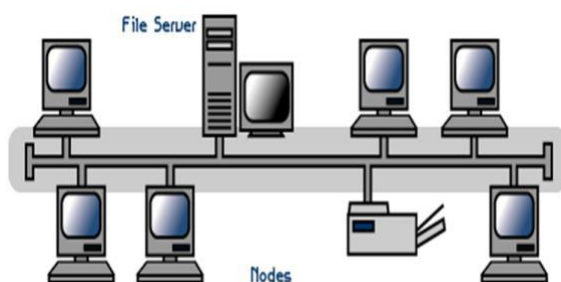


The major advantage of ring topology is its simplicity. Adding a new computer to the existing network is easy. Also, because each computer regenerates the messages that pass through it, ring networks can be deployed over larger areas than other topologies such as a bus network topology. The failure of a single node or a node connector does not affect the network. However, a failure (such as a break) of the ring cable affects the entire network.

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## Bus

Bus topology is an open-ended ring. All devices connect to an open-ended line. A bus network is the simplest to design and easiest

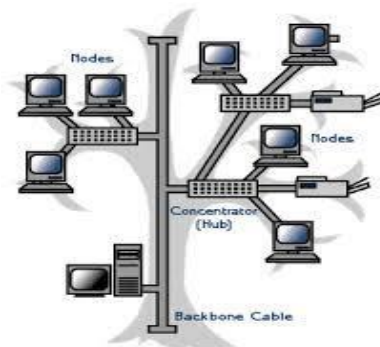


to wire. Individual nodes (such as PCs and printers) connect to a single cable using a network interface connector with a terminator at each end to prevent signal echo (signals bounce figure 19: bus topology

ing back). When a computer transmits a signal, it is broadcast to every other node. A receiving node filters signals addressed to it from other signals. A file server is typically treated just as any other node. Individual nodes can be added. Also, branches, which are essentially also buses, can be connected to the single cable bus as long as each cable has a terminator at the end. Failure of a single node does not affect the network, but failure of the cable does affect the entire network. Bus networks do not handle high traffic as well as ring networks.

## Tree

Tree topology-or hierarchical topology-consists of several stars connected to form a treelike structure. A tree lends itself to broadcasting messages in organizations because once the "root" computer launches a message, the message can be transmitted in parallel by the next layer of computers, each sending the



message to several other computers. Parallel transmission is its main advantage.

Its main disadvantage is that if the link of figure 20: tree topology

one star is disabled, all computers on that branch of the tree are disconnected from the rest of the network. The tree topology is more difficult to wire and configure than other topologies.

### 3.6.7.2 Networking hardware

Networks use a variety of devices to connect computers and peripheral devices (such as printers) to each other, and to connect networks to each other. Each computer or device connected to a network must have a network interface card (NIC), which connects through a cable or a wireless antenna to a hub, switch, bridge, or router, which in turn connects to a LAN or WAN.

A **hub** is a common device often used in bus and star topologies as a central location to connect computers or devices to a local network. A **switch** is like a hub, except that it is more "intelligent." Communications that go through a hub are broadcast to all devices attached to the hub; communications through a switch go only to designated devices on the network. A **bridge** is a device that connects two networks, such as a LAN to the Internet. A router also can connect dissimilar networks, and can be programmed to act as a firewall to filter communications. Routers keep tables of network addresses (IP addresses) that identify each computer on the network along with their routes to other network addresses.

## **Summary of the chapter**

Information technology deals with the use of electronic computers and computer software to convert, store, protect, process, transmit, and securely retrieve information.

A computer must handle four basic operations: accept data, store data, process data, and output data or information. In recent years computers are also expected to communicate over a network.

Computers are classified by their power: processing speed and storage capacity. There are different such as supercomputer, mainframe computer, midrange computer, and microcomputer.

There are number of Computer hardware which is a tangible part of the computer such as input devices, CPU, output devices and storage devices. The motherboard is the main component inside the case. It is a large rectangular board with integrated circuitry that connects the rest of the parts of the computer including the CPU, the RAM, the disk drives (CD, DVD, hard disk, or any others) as well as any peripherals connected via the ports or the expansion slots. Computer Hardware course is very important for the future because they are now essential in business.

Managers must consider these factors while they want to buy hardware devices The equipment's power, The equipment's expandability, The number and type of ports, sockets, Monitor type and resolution, Ergonomics, The reliability of the vendor, the warranty policy and the support given after the warranty expires and Cost.

*Software* is a set of instructions, data or programs used to operate computers and execute specific tasks. Opposite of hardware, which describes the physical aspects of a computer, *software* is a generic term used to refer to applications, scripts and programs that run on a device. It can be classified into two system or operating and application software.

A computer network is a group of computers that are connected to each other for the purpose of communication. Any computer network is classified on the basis of a wide variety of characteristics. Computers are connected through cables or wireless technologies to communicate with each other. Among the cables is twisted wire, coaxial cable, fiber optic. Computers also communicate using wireless technologies such as radio wave that are transmitted through microwave, satellite and blue tooth, and infrared technologies.

A Database is an integrated collection of logically related records or files consolidated into a common pool that provides data for one or more multiple uses. One way of classifying databases involves the type of content, for example: bibliographic, full-text, numeric, and image. Other classification methods start from examining database models or database architectures: see below. Software organizes the data in a database according to a database model. Relational model occurs most commonly. Other models such as the hierarchical model and the network model use a more explicit representation of relationships.

*Telecommunication* is the transmission of signs, signals, messages, words, writings, images and sounds or information of any nature by wire, radio, optical or other electromagnetic systems. *Telecommunication* occurs when the exchange of information between communication participants includes the use of technology.

### **Exercise Questions**

1. Identify the odd from the rest?  
A. Electronic mouse                      B. Trackball                      C. Touch pad  
D. Voice recognition                      E. Pointing stick                      F. Touch screens
2. Information systems provide output in variety of forms. Which of the following is not the form output produced by information systems?  
A. video outputs B. liquid crystal display C. printed outputs

D. voice E. A and B F. None

3. Identify the odd storage device.

A. Floppy disks            B. Compact disk recordable            C. Hard disks

D. magnetic disks            E. B and D            F. None of the above

4. People sitting in conference rooms thousands of miles apart are brought together by their transmitted images and speech in what is called\_\_\_\_\_.

5. In ----- communication, device A can transmit to device B, but device B cannot transmit to device A

6. In ----- communication, either device can transmit to the other device while simultaneously receiving signals from the other device.

7. Modification of a digital signal (from the computer) into an analog signal (for the phone line to transmit) is called-----.

8. A computer network within a building, or a campus of adjacent buildings, is called a -----.

## **CHAPTER FOUR**

### **4.COMMON BUSINESS APPLICATIONS OF INFORMATION TECHNOLOGY**

#### **4.1 Chapter Objective**

Dear learner, welcome to the fourth chapter of your module of management information system! In this chapter, you will learn the business applications of IT specifically in finance, in marketing, in production, in HRM, in decision, and transaction processing system. To realize the essence of the chapter you have to read each section with curiosity.

Dear learner After studying this chapter, you have capable to did the following:

Understand the importance of IT in business

Understand the implication of IT in finance

Understand the implications of IT in production or operations

Understand the applications of IT in decision making

Understand the interconnection between recording and IT

#### **4.2INTRODUCTION**

Business managers are moving from a tradition where they could avoid, delegate, or ignore decisions about IT to one where they cannot create a marketing, product, international, organization, or financial plan that does not involve IT. There are as many ways to use information technology in business as there are business activities to be performed, business problems to be solved, and business opportunities to be pursued. As a business professional, you should have a basic understanding and appreciation of the major ways information systems are used to support each of the functions of business that must be accomplished in any company that wants to succeed. Functional business systems, that is, a variety of types of information systems (transaction processing, management information, decision support, and so on) that support the business functions of accounting, finance, marketing, operations management, and human resource management.

### 4.3 IT in Business

As a business professional, it is also important that you have a specific understanding of how information systems affect a particular business function (e.g., marketing) or a particular industry (e.g., banking) that is directly related to your career objectives. For example, someone whose career objective is a marketing position in banking should have a basic understanding of how information systems are used in banking and how they support the marketing activities of banks and other firms.

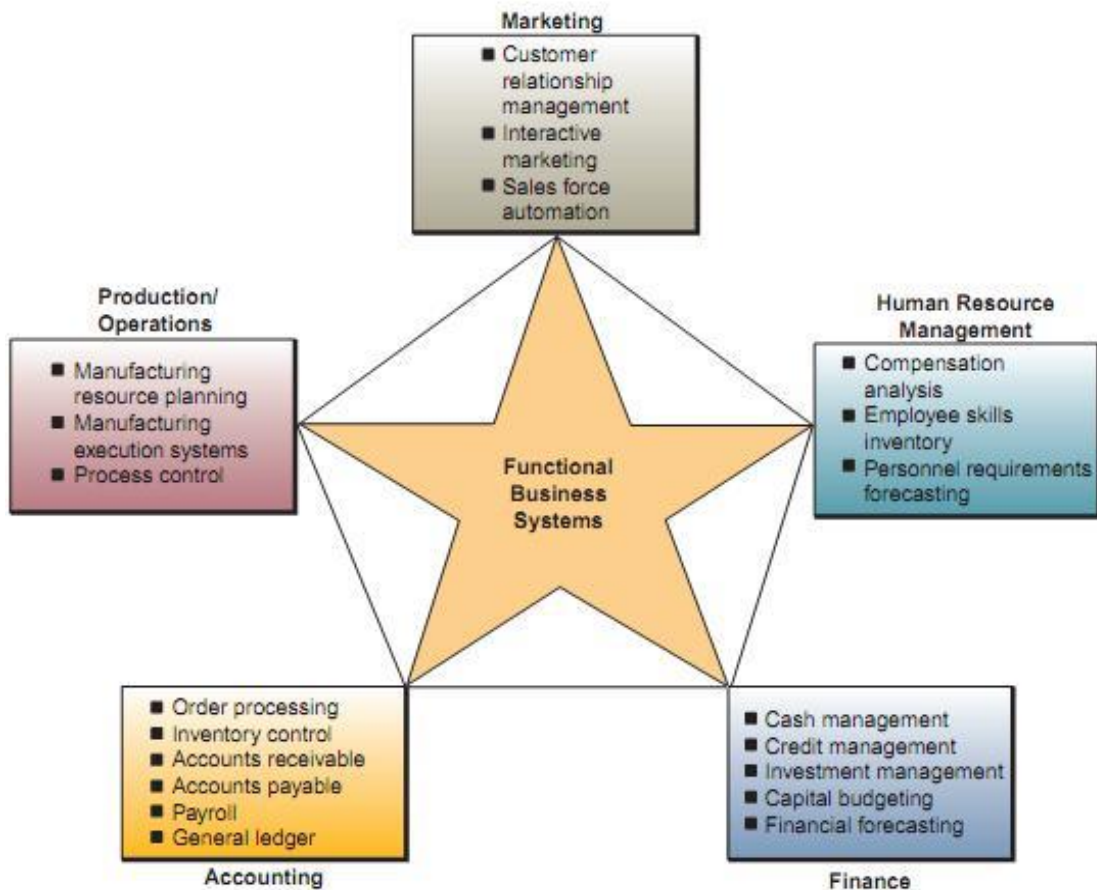


FIGURE 4.1 Examples of functional business information systems.

Figure 4.1 illustrates how information systems can be grouped into business function categories. Thus, information systems will be analyzed according to the business function they support by looking at a few key examples in each functional area. This should give you an appreciation of the variety of functional business systems that both small and large business firms may use.

## 4.4 Financial Management Systems

Computer-based financial management systems support business managers and professionals in decisions concerning (1) the financing of a business and (2) the allocation and control of financial resources within a business.

For example, the **capital budgeting** process involves evaluating the profitability and financial impact of proposed capital expenditures. Long-term expenditure proposals for facilities and equipment can be analyzed using a variety of return on investment (ROI) evaluation techniques. This application makes heavy use of spreadsheet models that incorporate present value analysis of expected cash flows and probability analysis of risk to determine the optimum mix of capital projects for a business.

Financial analysts also typically use electronic spreadsheets and other financial planning software to evaluate the present and projected financial performance of a business. They also help determine the financing needs of a business and analyze alternative methods of financing. Financial analysts use financial forecasts concerning the economic situation, business operations, and types of financing available, interest rates, and stock and bond prices to develop an optimal financing plan for the business. Electronic spreadsheet packages, DSS software, and Web-based groupware can be used to build and manipulate financial models. Answers to what-if and goal seeking questions can be explored as financial analysts and managers evaluate their financing and investment alternatives.

Major financial management system categories include cash and investment management, capital budgeting, financial forecasting, and financial planning.

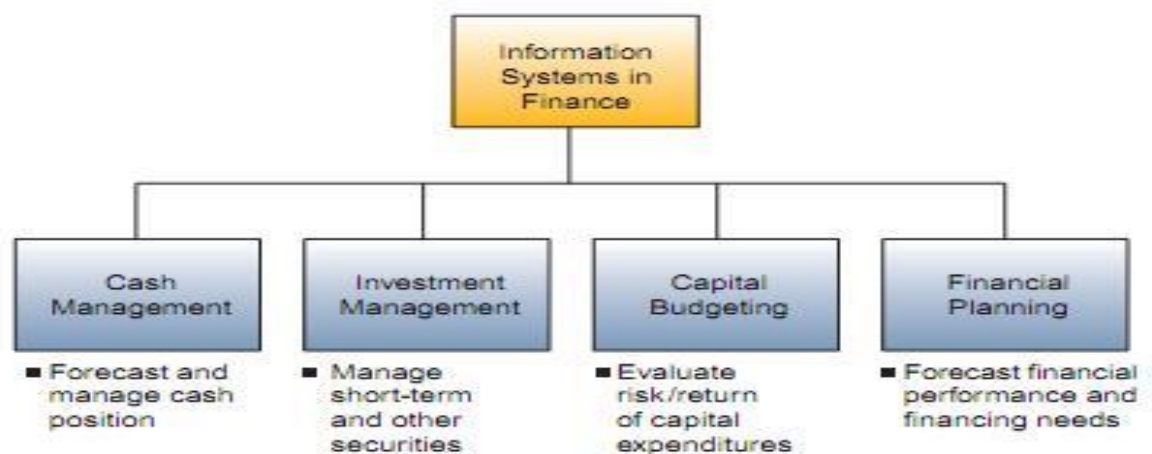


FIGURE 4.2: Examples of important financial management systems.

## **4.5 ACCOUNTING SYSTEMS**

Accounting information systems are the oldest and most widely used information systems in business. They record and report business transactions and other economic events. Computer-based accounting systems record and report the flow of funds through an organization on a historical basis and produce important financial statements such as balance sheets and income statements. Such systems also produce forecasts of future conditions such as projected financial statements and financial budgets. A firm's financial performance is measured against such forecasts by other analytical accounting reports.

Operational accounting systems emphasize legal and historical record-keeping and the production of accurate financial statements. Typically, these systems include transaction processing systems such as order processing, inventory control, accounts receivable, accounts payable, payroll, and general ledger systems. Management accounting systems focus on the planning and control of business operations. They emphasize cost accounting reports, the development of financial budgets and projected financial statements, and analytical reports comparing actual to forecasted performance.

There are several important accounting information systems commonly computerized by both large and small businesses. Many accounting software packages are available for these applications. Figure 4.2 below provides a good summary of the essential purpose of six common, but important, accounting information systems used by both large and small business firms.

### **4.5.1 Online Accounting Systems**

It should come as no surprise that the accounting information systems are being transformed by Internet technologies. Using the Internet and other networks changes how accounting information systems monitor and track business activity. The interactive nature of online accounting systems calls for new forms of transaction documents, procedures, and controls. This particularly applies to systems like order processing, inventory control, accounts receivable, and accounts payable. These systems are directly involved in the processing of transactions between a business and its customers and suppliers. So, naturally, many companies are using Internet and

other network links to these trading partners for such online transaction processing systems.

Common Business Accounting Systems	
• <b>Order Processing</b>	Captures and processes customer orders and produces data for inventory control and accounts receivable.
• <b>Inventory Control</b>	Processes data reflecting changes in inventory and provides shipping and reorder information.
• <b>Accounts Receivable</b>	Records amounts owed by customers and produces customer invoices, monthly customer statements, and credit management reports.
• <b>Accounts Payable</b>	Records purchases from, amounts owed to, and payments to suppliers, and produces cash management reports.
• <b>Payroll</b>	Records employee work and compensation data and produces paychecks and other payroll documents and reports.
• <b>General Ledger</b>	Consolidates data from other accounting systems and produces the periodic financial statements and reports of the business.

FIGURE 4.2 A summary of six essential accounting information systems used in business.

#### 4.6 MARKETING SYSTEMS

The business function of marketing is concerned with the planning, promotion, and sale of existing products in existing markets, and the development of new products and new markets to better attract and serve present and potential customers. Thus, marketing performs an essential function in the operation of a business enterprise. Business firms have increasingly turned to IT to help them perform vital marketing functions in the face of the rapid changes of today's environment.

Figure 4.4 illustrates how marketing information systems provide IT that support major components of the marketing function. For example, Internet/intranet Web sites and services make an interactive marketing process possible where customers can become partners in creating, marketing, purchasing, and improving products and services. Sales force automation systems use mobile computing and Internet technologies to automate many information processing activities for sales support and management. Other marketing information systems assist marketing managers in product planning, pricing, and other product management decisions; advertising, sales promotion, and targeted marketing strategies; and market research and forecasting. Finally, enterprisewide systems like customer relationship management link to the

portfolio of marketing information systems to provide and obtain data essential to the marketing function. Let's take a closer look at three of these marketing applications:

#### 4.6.1 Interactive Marketing

The term interactive marketing has been coined to describe a customer-focused marketing process that is based on using the Internet, intranets, and extranets to establish two-way transactions between a business and its customers or potential customers. The goal of interactive marketing is to enable a company to use those networks profitably to attract and keep customers who will become partners with the business in creating, purchasing, and improving products and services.

In interactive marketing, customers are not just passive participants who receive media advertising prior to purchase; they are actively engaged in network-enabled proactive and interactive processes. Interactive marketing encourages customers to become involved in product development, delivery, and service issues. This is enabled by various Internet technologies, including chat and discussion groups, Web forms and questionnaires, instant messaging, and e-mail correspondence. Finally, the expected outcomes of interactive marketing are a rich mixture of vital marketing data, new product ideas, volume sales, and strong customer relationships.



FIGURE 4.3 Marketing information systems provide information technologies to support major components of the marketing function.

#### 4.6.2 Targeted Marketing

Targeted marketing has become an important tool in developing advertising and promotion strategies to strengthen a company's e-commerce initiatives, as well as its traditional business venues. As illustrated in Figure 4.5, targeted marketing is an advertising and promotion management concept that includes five targeting components:

- ⊕ **Community:** Companies can customize their Web advertising messages and promotion methods to appeal to people in specific communities. They can be communities of interest, such as virtual communities of online sporting enthusiasts, or arts and crafts hobbyists, or geographic communities formed by the Web sites of a city or other local organization.

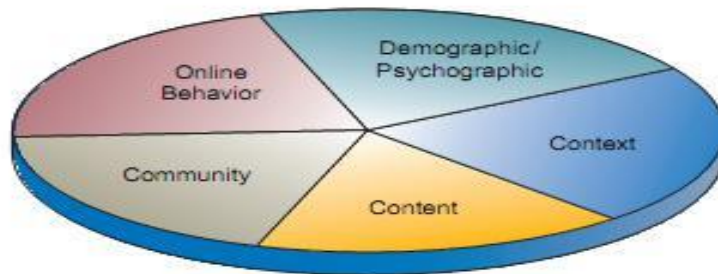


FIGURE 4.4 The five major components of targeted marketing for electronic commerce.

- ⊕ **Content:** Advertising, such as electronic billboards or banners, can be placed on a variety of selected Web sites, in addition to a company's Web site. The content of these messages is aimed at the targeted audience. An ad for a product campaign on the opening page of an internet search engine is a typical example.
- ⊕ **Context:** Advertising appears only in Web pages that are relevant to the content of a product or service. So, advertising is targeted only at people who are already looking for information about a subject matter (e.g., vacation travel) that is related to a company's products (e.g., car rental services).
- ⊕ **Demographic/Psychographic:** Web marketing efforts can be aimed only at specific types or classes of people: for example, unmarried, twenty-something, middle income, male college graduates.
- ⊕ **Online Behavior:** Advertising and promotion efforts can be tailored to each visit to a site by an individual. This strategy is based on a variety of tracking techniques, such as Web "cookie" files recorded on the visitor's disk drive from previous visits. This enables a company to track a person's online behavior at its Web site so marketing efforts (such as coupons redeemable at retail stores or e-commerce Web sites) can be targeted to that individual at each visit to its Web site.

An interesting and effective marriage between e-business and target marketing is the emergence of the digital billboard. While only a tiny fraction of them are digital, the new billboards are making a huge impact on markets all over the world. The concept behind the digital billboard is elegantly simple. A billboard is constructed using hundreds of thousands of small LEDs (Light Emitted Diode), which are controlled via a computer interface that can be accessed via the Web. Advertisers can change their messages quickly, including multiple times in one day. For example, a restaurant can feature breakfast specials in the morning and dinner specials in the evening. A realtor can feature individual houses for sale and change the creative content when the house sells. Print and broadcast news media alike use digital billboards to deliver headlines, weather updates, and programming information. Target marketing is in the digital arena, with a new way of doing something old.

#### **4.6.3 Sales Force Automation**

Increasingly, computers and the Internet are providing the basis for sales force automation. In many companies, the sales force is being outfitted with notebook computers, Web browsers, and sales contact management software that connect them to marketing Web sites on the Internet, extranets, and their company intranets. This is not only increasing the personal productivity of salespeople, but it dramatically speeds up the capture and analysis of sales data from the field to marketing managers at company headquarters. In return, it allows marketing and sales management to improve the delivery of information and the support they provide to their salespeople. Therefore, many companies are viewing sales force automation as a way to gain a strategic advantage in sales productivity and marketing responsiveness.

For example, salespeople use their PCs to record sales data as they make their calls on customers and prospects during the day. Then each night, sales reps in the field can connect their computers by modem and telephone links to the Internet and extranets, which can access intranet or other network servers at their company. Then, they can upload information on sales orders, sales calls, and other sales statistics, as well as send e-mail messages and access Web site sales support information. In return, the network servers may download product availability data, prospect lists of information on good sales prospects, and e-mail messages.

#### 4.6.4 Customer Relationship Management and Sales Ordering

customer relationship management (CRM) system helps a company to manage all aspects of customer encounters, including marketing and advertising, sales, customer service after the sale, and programs to keep and retain loyal customers (see the below Figure). The goal of CRM is to understand and anticipate the needs of current and potential customers to increase customer retention and loyalty while optimizing the way that products and services are sold. CRM is used primarily by people in the sales, marketing, and service organizations to capture and view data about customers and improve communications. Businesses implementing CRM systems report benefits such as improved customer satisfaction, increased customer retention, reduced operating costs, and the ability to meet customer demand.

CRM software automates and integrates the functions of sales, marketing, and service in an organization. The objective is to capture data about every contact a company has with a customer through every channel and store it in the CRM system so the company can truly understand customer actions. CRM software helps an organization build a database about its customers that describes relationships in sufficient detail so that management, salespeople, customer service providers—and even customers—can access information to match customer needs with product plans and offerings, remind them of service requirements, and know what other products they have purchased. The below Figure shows contact manager software from SAP that fills this CRM role.

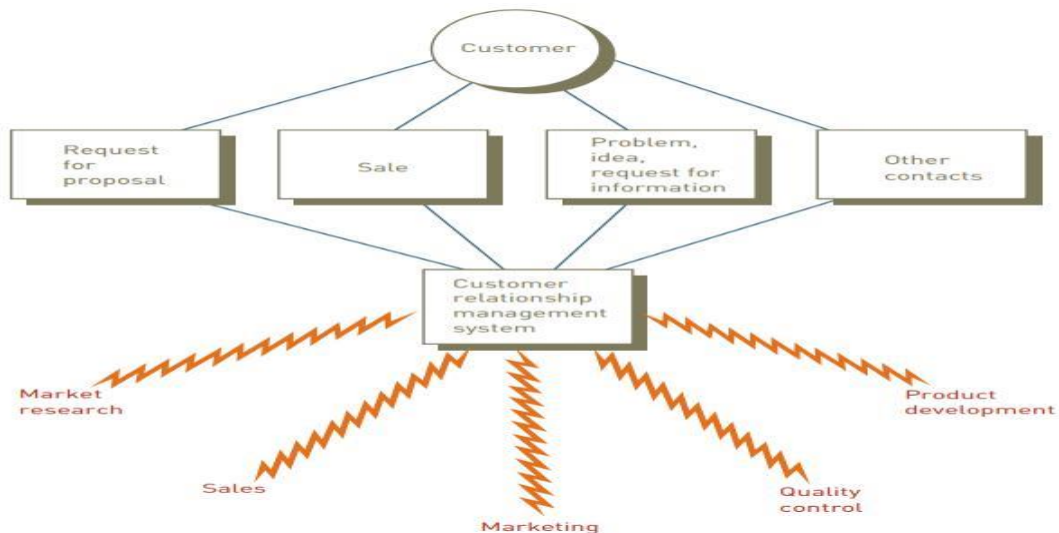


Figure 4.5: CRM

The key features of a CRM system include the following:

*Contact management:* The ability to track data on individual customers and sales leads and access that data from any part of the organization.

*Sales management:* The ability to organize data about customers and sales leads and then to prioritize the potential sales opportunities and identify appropriate next steps.

*Customer support:* The ability to support customer service reps so that they can quickly, thoroughly, and appropriately address customer requests and resolve customers' issues while at the same time collecting and storing data about those interactions.

*Marketing automation:* The ability to capture and analyze all customer interactions, generate appropriate responses, and gather data to create and build effective and efficient marketing campaigns.

*Analysis:* The ability to analyze customer data to identify ways to increase revenue and decrease costs, identify the source of the firm's "best customers," and determine how to retain them and find even more of them.

#### **4.7 Manufacturing information systems**

Manufacturing information systems support the production/operations function that includes all activities concerned with the planning and control of the processes producing goods or services. Thus, the production/operations function is concerned with the management of the operational processes and systems of all business firms. Information systems used for operations management and transaction processing support all firms that must plan, monitor, and control inventories, purchases, and the flow of goods and services. Therefore, firms such as transportation companies, wholesalers, retailers, financial institutions, and service companies must use production/operations information systems to plan and control their operations.

##### **4.7.1 Computer Integrated Manufacturing**

A variety of manufacturing information systems, many of them Web-enabled, are used to support computer-integrated manufacturing (CIM). CIM is an overall concept that emphasizes that the objectives of computer-based systems in manufacturing must be to:

- ✿ **Simplify (reengineer):** production processes, product designs, and factory organization as a vital foundation to automation and integration.
- ✿ **Automate production:** processes and the business functions that support them with computers, machines, and robots.
- ✿ **Integrate:** all production and support processes using computer networks, cross-functional business software, and other information technologies.

The overall goal of CIM and such manufacturing information systems is to create flexible, agile, manufacturing processes that efficiently produce products of the highest quality. Thus, CIM supports the concepts of flexible manufacturing systems, agile manufacturing, and total quality management. Implementing such manufacturing concepts enables a company to respond to and fulfill customer requirements quickly with high-quality products and services.

Manufacturing information systems help companies simplify, automate, and integrate many of the activities needed to produce products of all kinds. For example, computers are used to help engineers design better products using both computer-aided engineering (CAE) and computer-aided design (CAD) systems, and better production processes with computer-aided process planning. They are also used to help plan the types of material needed in the production process, which is called material requirements planning (MRP), and to integrate MRP with production scheduling and shop floor operations, which is known as manufacturing resource planning. Many of the processes within manufacturing resource planning systems are included in the manufacturing module of enterprise resource planning (ERP) software.

- A. Computer-aided manufacturing (CAM)** systems are those that automate the production process. For example, this could be accomplished by monitoring and controlling the production process in a factory (manufacturing execution systems) or by directly controlling a physical process (process control), a machine tool (machine control), or machines with some humanlike work capabilities (robots).
- i. Manufacturing execution systems (MES)** are performance-monitoring information systems for factory floor operations. They monitor, track, and control the five essential components involved in a production process: materials, equipment, personnel, instructions and specifications, and production facilities.

MES includes shop floor scheduling and control, machine control, robotics control, and process control systems. These manufacturing systems monitor, report, and adjust the status and performance of production components to help a company achieve a flexible, high-quality manufacturing process.

- ii. **Process control** is the use of computers to control an ongoing physical process. Process control computers control physical processes in petroleum refineries, cement plants, steel mills, chemical plants, food product manufacturing plants, pulp and paper mills, electric power plants, and so on. A process control computer system requires the use of special sensing devices that measure physical phenomena such as temperature or pressure changes. These continuous physical measurements are converted to digital form by analog-to-digital converters and relayed to computers for processing.
- iii. **Machine control** is the use of computers to control the actions of machines. This is also popularly called numerical control. The computer-based control of machine tools to manufacture products of all kinds is a typical numerical control application used by many factories throughout the world.

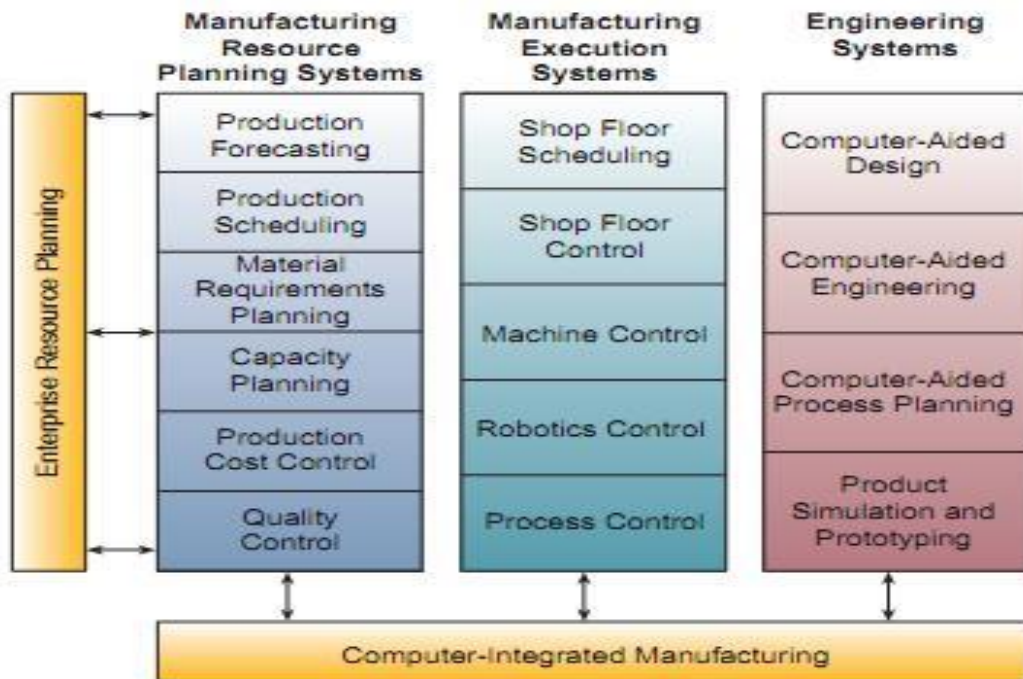


FIGURE 4.6 Manufacturing information systems support computer integrated manufacturing. Note that manufacturing resource planning systems are one of the application clusters in an ERP system

## **4.8 Human resource systems**

The human resource management (HRM) function involves the recruitment, placement, evaluation, compensation, and development of the employees of an organization. The goal of human resource management is the effective and efficient use of the human resources of a company. Thus, human resource information systems (HRIS) are designed to support (1) planning to meet the personnel needs of the business, (2) development of employees to their full potential, and (3) control of all personnel policies and programs. Originally, businesses used computer-based information systems to (1) produce paychecks and payroll reports, (2) maintain personnel records, and (3) analyze the use of personnel in business operations. Many firms have gone beyond these traditional personnel management functions and have developed human resource information systems that also support (1) recruitment, selection, and hiring; (2) job placement; (3) performance appraisals; (4) employee benefits analysis; (5) training and development; and (6) health, safety, and security.

### **4.8.1 HRM and the Internet**

The Internet has become a major force for change in human resource management. For example, online HRM systems may involve recruiting for employees through recruitment sections of corporate Web sites. Companies are also using commercial recruiting services and databases on the World Wide Web, posting messages in selected Internet newsgroups, and communicating with job applicants via e-mail.

The Internet has a wealth of information and contacts for both employers and job hunters. Top Web sites for job hunters and employers on the World Wide Web include Monster.com, HotJobs.com, and CareerBuilder.com. These Web sites are full of reports, statistics, and other useful HRM information, such as job reports by industry, or listings of the top recruiting markets by industry and profession.

### **4.8.2 HRM and Corporate Intranets**

Intranet technologies allow companies to process most common HRM applications over their corporate intranets. Intranets allow the HRM department to provide around-the-clock services to their customers: the employees. They can also disseminate valuable information faster than through previous company channels. Intranets can collect information online from employees for input to their HRM files, and they can enable managers and other employees to perform HRM tasks with little intervention by the HRM department.

For example, employee self-service (ESS) intranet applications allow employees to view benefits, enter travel and expense reports, verify employment and salary information, access and update their personal information, and enter time-sensitive data. Through this completely electronic process, employees can use their Web browsers to look up individual payroll and benefits information online, right from their desktop PCs, mobile computers, or intranet kiosks located around a work site.

Another benefit of the intranet is that it can serve as a superior training tool. Employees can easily download instructions and processes to get the information or education they need. In addition, employees using new technology can view training videos over the intranet on demand. Thus, the intranet eliminates the need to loan out and track training videos. Employees can also use their corporate intranets to produce automated pay sheets, the online alternative to time cards. These electronic forms have made viewing, entering, and adjusting payroll information easy for both employees and HRM professionals.

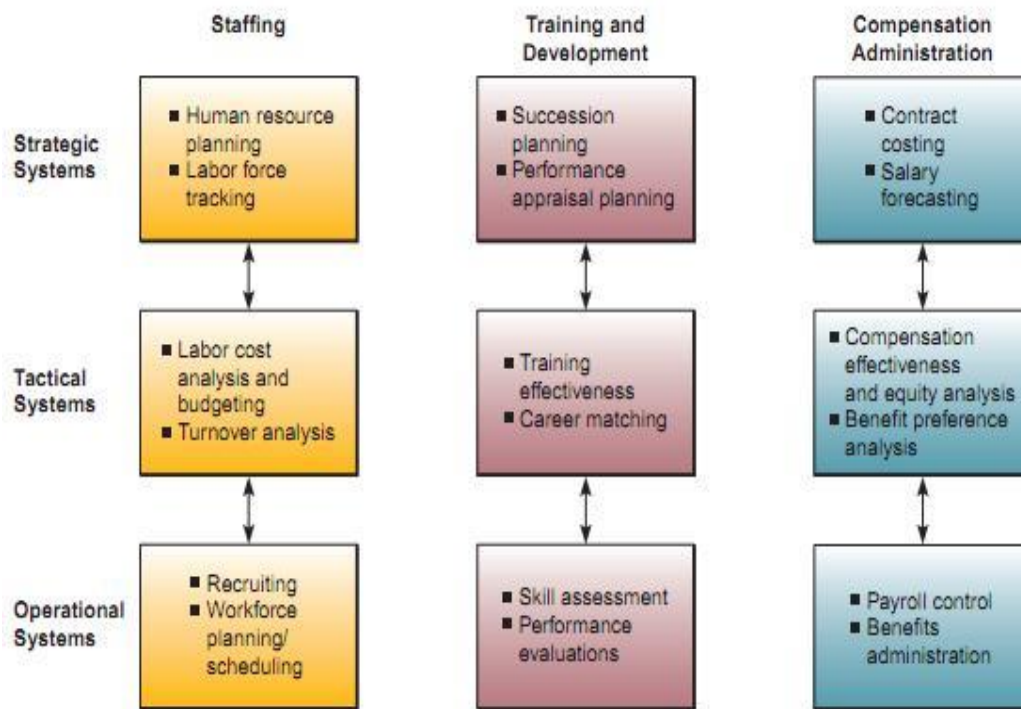


FIGURE 4.7 Human resource information systems support the strategic, tactical, and operational use of the human resources of an organization.

## **4.9 DECISION SUPPORT SYSTEMS**

Decision support systems are interactive, computer-based information systems that use DSS software and a model base and database to provide information tailored to support semi structured decisions faced by individual managers. They are designed to use a decision makers own insights and judgments in an ad hoc, interactive, analytical modeling process leading to a specific decision.

Decision support systems are a major category of management support systems. They are computer-based information systems that provide interactive information support to managers during the decision-making process. Decision support systems use: Analytical models, Specialized databases, A decision maker's own insights and judgments and An interactive, computer-based modeling process to support making of semi structured and unstructured decisions by individual managers.

Therefore, DSS are designed to be ad-hoc, quick-response systems that are initiated and controlled by managerial end users. Decision support systems are thus able to directly support the specific types of decisions and the personal decision-making styles and needs of individual managers.

### **4.9.1 DSS Models and software**

Unlike management information systems, decision support systems rely on model bases as well as databases as vital system resources. A DSS model base is a software component that consists of models used in computational and analytical routines that mathematically express relationships among variables. For example, a spreadsheet program might contain models that express simple accounting relationships among variables, such as  $\text{Revenue} - \text{Expenses} = \text{Profit}$ . Or a DSS model base could include models and analytical techniques used to express much more complex relationships. For example, it might contain linear programming models, multiple regression forecasting models, and capital budgeting present value modes. Such models may be stored in the form of spreadsheet models or templates, or statistical and mathematical programs and program modules.

Using a decision support system involves four basic types of analytical modeling activities as What-if analysis, Sensitivity analysis, Goal-seeking analysis and Optimization analysis:

**What if Analysis:** In What if Analysis, an end user makes changes to variables, or relationships among variables, and observes the resulting changes in the values of other variables. For example, if you were using a spreadsheet, you might change a revenue amount (a variable) or a tax rate formula (a relationship among variables) in a simple financial spreadsheet model. Then you could command the spreadsheet program to instantly recalculate all affected variables in the spreadsheet. A managerial user would be very interested in observing and evaluating any changes that occurred to the values in the spreadsheet, especially to a variable such as net profit after taxes. To many managers, net profit after taxes is an example of the bottom line, that is, a key factor in making many types of decisions. This type of analysis would be repeated until the manager was satisfied with what the results revealed about the effects of various possible decisions.

**Sensitivity Analysis:** Sensitivity analysis is a special case of what if analysis. Typically, the value of only one variable is changed repeatedly, and the resulting changes on other variables are observed. So, sensitivity analysis is really a case of what-if analysis involving repeated changes to only one variable at a time. Some DSS packages automatically make repeated small changes to a variable when asked to perform sensitivity analysis. Typically, sensitivity analysis is used when decision makers are uncertain about the assumptions made in estimating the value of certain key variables. In our previous spreadsheet example, the value of revenue could be changed repeatedly in small increments, and the effects on other spreadsheet variables observed and evaluated. This would help a manager understand the impact of various revenue levels on other factors involved in decisions being considered.

**Goal-seeking analysis:** Goal-seeking analysis reverses the direction of the analysis done in what-if and sensitivity analysis. Instead of observing how changes in a variable affect other variables, goal-seeking analysis (also called how can analysis) sets a target value or a goal for a variable and then repeatedly changes other variables until the target value is achieved. For example, you could specify a target value or goal of 2 Million Birr for net profit after taxes for a business venture. Then you could repeatedly change the value of revenue or expenses in a spreadsheet model until a result of 2 Million Birr is achieved. Thus, you would discover what amount of revenue or level of expenses the business venture needs to achieve in order to reach the goal of 2 Million Birr in after-tax profits. Therefore, this form of analytical

modeling would help answer the question, “How can we achieve 2 Million Birr in net profit after taxes?” instead of the question, “What happens if we change revenue or expenses?” Thus, goal seeking analysis is another important method of decision support.

**Optimization Analysis:** Optimization analysis is a more complex extension of goal-seeking analysis. Instead of setting a specific target value for a variable, the goal is to find the optimum value for one or more target variables, given certain constraints. Then one or more variables are changed repeatedly, subject to the specified constraints, until the best values for the target variables are discovered. For example, you could try to determine the highest possible level of profits that could be achieved by varying the values for selected revenue sources and expense categories. Changes to such variables could be subject to constraints such as the limited capacity of a production process or limits to available financing. Optimization, typically, is accomplished by special-purpose software packages for optimization techniques such as linear programming, or by advanced DSS generators.

**Activities and examples of the major types of analytical modeling:**

<b>Type of analytical Modeling</b>	<b>Activities and Examples</b>
<b>What-if analysis</b>	Observing how changes to selected variables affect other variables.  Example: What if we cut advertising by 10 percent?  What would happen to sales?
<b>Sensitivity analysis</b>	Observing how repeated changes to a single variable affect other variables.  Example: Let’s cut advertising by 1000 Birr repeatedly so we can see its relationship to sales.
<b>Goal-seeking analysis</b>	Making repeated changes to selected variables until a chosen variable reaches a target value.  Example: Let’s try increase in advertising until sales reach 1

	Million Birr.
<b>Optimization analysis</b>	Finding an optimum value for selected variables, given certain constraints.  Example: What's the best amount of advertising to have, given our budget and choice of media?

### Relationship between DSS and MIS

Feature	Management Information systems	Decision support systems
Provided support	Provides information about the performance of the organization	Provides information and decision support techniques to analyze specific problems or opportunities
Information form and frequency	Periodic, exception, demand, and push reports and responses	Interactive inquiries and responses
Information format	Pre-specified, fixed format	Ad hoc, flexible, and adaptable format
Information processing methodology	Information produced by extraction and manipulation of business data	Information produced by analytical modeling of business data

### 4.10 TRANSACTION PROCESSING SYSTEMS

Transaction processing systems (TPS) are cross-functional information systems that process data resulting from the occurrence of business transactions. Transactions are events that occur as part of doing business, such as sales, purchases, deposits, withdrawals, refunds, and payments. Think, for example, of the data generated whenever a business sells something to a customer on credit, whether in a retail store or at an e-commerce site on the Web. Data about the customer, product, salesperson, store, and so on, must be captured and processed. This need prompts additional

transactions, such as credit checks, customer billing, inventory changes, and increases in accounts receivable balances, which generate even more data. Thus, transaction processing activities are needed to capture and process such data, or the operations of a business would grind to a halt. Therefore, transaction processing systems play a vital role in supporting the operations of most companies today.

Online transaction processing systems play a strategic role in Web-enabled businesses. Many firms are using the Internet and other networks that tie them electronically to their customers or suppliers for online transaction processing (OLTP). Such real-time systems, which capture and process transactions immediately, can help firms provide superior service to customers and other trading partners. This capability adds value to their products and services, and thus gives them an important way to differentiate themselves from their competitors.

#### **4.10.1 The Transaction Processing Cycle**

Transaction processing systems, such as capture and process data describing business transactions, update organizational databases, and produce a variety of information products. You should understand this as a transaction processing cycle of several basic activities.

- A. Data Entry.** The first step of the transaction processing cycle is the capture of business data. For example, transaction data may be collected by point-of-sale terminals using optical scanning of bar codes and credit card readers at a retail store or other business. Transaction data can also be captured at an e-commerce Web site on the Internet. The proper recording and editing of data so they are quickly and correctly captured for processing is one of the major design challenges of information systems.
- B. Transaction Processing.** Transaction processing systems process data in two basic ways: (1) batch processing, where transaction data are accumulated over a period of time and processed periodically, and (2) real-time processing (also called online processing), where data are processed immediately after a transaction occurs. All online transaction processing systems incorporate real-time processing capabilities. Many online systems also depend on the capabilities of fault tolerant computer systems that can continue to operate even if parts of the system fail.

- C. Database Maintenance.** An organization's databases must be updated by its transaction processing systems so that they are always correct and up-to-date. Therefore, transaction processing systems serve to assist in maintaining the corporate databases of an organization to reflect changes resulting from day-to-day business transactions. For example, credit sales made to customers will cause customer account balances to be increased and the amount of inventory on hand to be decreased. Database maintenance ensures that these and other changes are reflected in the data records stored in the company's databases.
- D. Document and Report Generation.** Transaction processing systems produce a variety of documents and reports. Examples of transaction documents include purchase orders, paychecks, sales receipts, invoices, and customer statements. Transaction reports might take the form of a transaction listing such as a payroll register, or edit reports that describe errors detected during processing.
- E. Inquiry Processing.** Many transaction processing systems allow you to use the Internet, intranets, extranets, and Web browsers or database management query languages to make inquiries and receive responses concerning the results of transaction processing activity. Typically, responses are displayed in a variety of pre-specified formats or screens. For example, you might check on the status of a sales order, the balance in an account, or the amount of stock in inventory and receive immediate responses at your PC.

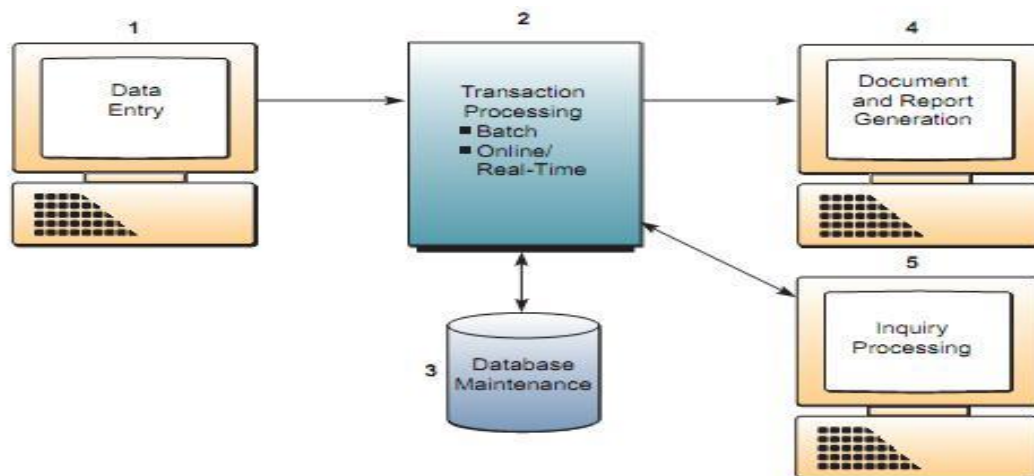
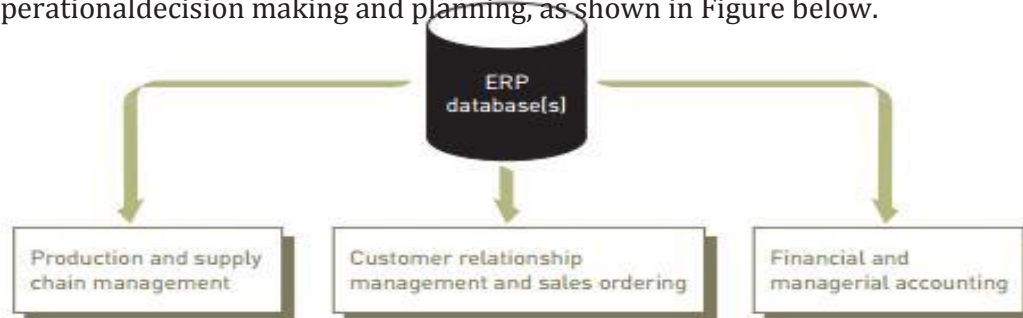


FIGURE 4.9 The transaction processing cycle.

Note that transaction processing systems use a five-stage cycle of data entry, transaction processing, database maintenance, document and report generation, and inquiry processing activities.

#### 4.11 Enterprise resource planning

enterprise resource planning (ERP) is a set of integrated programs that manage a company's vital business operations for an entire multisite, global organization. Recall that a business process is a set of coordinated and related activities that takes one or more types of input and creates an output of value to the customer of that process. The customer might be a traditional external business customer who buys goods or services from the firm. An example of such a process is capturing a sales order, which takes customer input and generates an order. The customer of a business process might also be an internal customer such as a worker in another department of the firm. For example, the shipment process generates the internal documents workers need in the warehouse and shipping departments to pick, pack, and ship orders. At the core of the ERP system is a database that is shared by all users so that all business functions have access to current and consistent data for operational decision making and planning, as shown in Figure below.



ERP systems evolved from materials requirement planning systems (MRP) developed in the 1970s. These systems tied together the production planning, inventory control, and purchasing business functions for manufacturing organizations. During the late 1980s and early 1990s, many organizations recognized that their legacy transaction processing systems lacked the integration needed to coordinate activities and share valuable information across all the business functions of the firm. As a result, costs were higher and

customer service poorer than desired. Large organizations, members of the *Fortune* 1000, were the first to take on the challenge of implementing ERP. As they did, they uncovered many advantages as well as some disadvantages summarized in the following sections.

### **Advantages of ERP**

*Improved Access to Data for Operational Decision Making:* ERP systems operate via an integrated database, using one set of data to support all business functions. The systems can support decisions on optimal sourcing or cost accounting, for instance, for the entire enterprise or business units from the start, rather than gathering data from multiple business functions and then trying to coordinate that information manually or reconciling data with another application.

*Elimination of Costly, Inflexible Legacy Systems:* Adoption of an ERP system enables an organization to eliminate dozens or even hundreds of separate systems and replace them with a single, integrated set of applications for the entire enterprise. In many cases, these systems are decades old, the original developers are long gone, and the systems are poorly documented. As a result, the systems are extremely difficult to fix when they break, and adapting them to meet new business needs takes too long. They become an anchor around the organization that keeps it from moving ahead and remaining competitive. An ERP system helps match the capabilities of an organization's information systems to its business needs—even as these needs evolve.

*Improvement of Work Processes:* Competition requires companies to structure their business processes to be as effective and customer oriented as possible. ERP vendors do considerable research to define the best business processes. They gather requirements of leading companies within the same industry and combine them with research findings from research institutions and consultants. The individual application modules included in the ERP system are then designed to support these best practices, the most efficient and effective ways to complete a business process. Thus, implementation of an ERP system ensures good work processes based on best practices.

### **Disadvantages of ERP Systems**

*Expense and Time in Implementation:* Getting the full benefits of ERP takes time and money. Although ERP offers many strategic advantages by streamlining a company's

TPSs, large firms typically need three to five years and spend tens of millions of dollars to implement a successful ERP system.

*Difficulty Implementing Change:* In some cases, a company has to radically change how it operates to conform to the ERP's work processes—its best practices. These changes can be so drastic to long-time employees that they retire or quit rather than go through the change. This exodus can leave a firm short of experienced workers. Sometimes, the best practices simply are not appropriate for the firm and cause great work disruptions.

*Difficulty Integrating with Other Systems:* Most companies have other systems that must be integrated with the ERP system, such as financial analysis programs, e-commerce operations, and other applications. Many companies have experienced difficulties making these other systems operate with their ERP system.

*Risks in Using One Vendor:* The high cost to switch to another vendor's ERP system makes it extremely unlikely that a firm will do so. After a company has adopted an ERP system, the vendor has less incentive to listen and respond to customer concerns. The high cost to switch also increases risk—in the event the ERP vendor allows its product to become outdated or goes out of business. Selecting an ERP system involves not only choosing the best software product but also the right long-term business partner.

#### **4.10.1 Production and Supply Chain Management**

ERP systems follow a systematic process for developing a production plan that draws on the information available in the ERP system database. The process starts with *sales forecasting* to develop an estimate of future customer demand. This initial forecast is at a fairly high level with estimates made by product group rather than by each individual product item. The sales forecast extends for months into the future; it might be developed using an ERP software module or produced by other means using specialized software and techniques. Many organizations are moving to a collaborative process with major customers to plan future inventory levels and production rather than relying on an internally generated sales forecast.

Eric Kapinos, Director of Forecasting and Planning at Oberto, leads a forecasting process that is executed by a team of individuals using sales forecasting tools. “We have a full complement of ForecastPro products at Oberto,” explains Kapinos, “We

use Forecast Pro Unlimited as the main foundation for our demand forecasting process it's where the forecast is generated and maintained. He said After we establish the forecast, it is fed into our ERP system where it drives procurement, planning, scheduling, and plant execution.”

The *sales and operations plan (S&OP)* take demand and current inventory levels into account and determines the specific product items that need to be produced and when to meet the forecast future demand. Production capacity and any seasonal variability in demand must also be considered. The result is a high-level production plan that balances market demand to production capacity. During S&OP meetings, various sales scenarios and options for meeting those scenarios are evaluated based on revenue, profit, and inventory impact, and then compared to operating plans. The advantages of this rigorous approach are “aligned strategy and operations, improved visibility and control over the global supply chain, fact-based planning, concentrating on exceptions and consistent performance management.”

*Demand management*: refines the production plan by determining the amount of weekly or daily production needed to meet the demand for individual products. The output of the demand management process is the master production schedule, which is a production plan for all finished goods.

*Detailed scheduling*: uses the production plan defined by the demand management process to develop a detailed production schedule specifying production scheduling details, such as which item to produce first and when production should be switched from one item to another. A key decision is how long to make the production runs for each product. Longer production runs reduce the number of machine setups required, thus reducing production costs. Shorter production runs generate less finished product inventory and reduce inventory holding costs.

*Materials requirement planning*: determines the amount and timing for placing raw material orders with suppliers. The types and amounts of raw materials required to support the planned production schedule are determined based on the existing raw material inventory and the bill of materials or BOM, a sort of “recipe” of ingredients needed to make each product item. The quantity of raw materials to order also depends on the lead time and lot sizing. Lead time is the amount of time it takes from the placement of a purchase order until the raw materials arrive at the production facility.

Lot size has to do with discrete quantities that the supplier will ship and the amount that is economical for the producer to receive and/or store.

*Purchasing* uses: the information from materials requirement planning to place purchase orders for raw materials and transmit them to qualified suppliers. Typically, the release of these purchase orders is timed so that raw materials arrive just in time to be used in production and minimize warehouse and storage costs. Often, producers will allow suppliers to tap into data via an extranet that enables them to determine what raw materials the supplier needs, thus minimizing the effort and lead time to place and fill purchase orders.

*Production* uses: the detailed schedule to plan the details of running and staffing the production operation. ERP systems do not work directly with production machines, so they need a way to capture information about what was produced. This data must be passed to the ERP accounting modules to keep an accurate count of finished product inventory.

#### **4.10.2 Customer Relationship Management and Sales Ordering**

customer relationship management (CRM) system helps a company to manage all aspects of customer encounters, including marketing and advertising, sales, customer service after the sale, and programs to keep and retain loyal customers (see the below Figure). The goal of CRM is to understand and anticipate the needs of current and potential customers to increase customer retention and loyalty while optimizing the way that products and services are sold. CRM is used primarily by people in the sales, marketing, and service organizations to capture and view data about customers and improve communications. Businesses implementing CRM systems report benefits such as improved customer satisfaction, increased customer retention, reduced operating costs, and the ability to meet customer demand. *Contact management*: The ability to track data on individual customers and sales leads and access that data from any part of the organization

*Sales management*: The ability to organize data about customers and sales leads and then to prioritize the potential sales opportunities and identify appropriate next steps

*Customer support*: The ability to support customer service reps so that they can quickly, thoroughly, and appropriately address customer requests and resolve

customers' issues while at the same time collecting and storing data about those interactions

*Marketing automation:* The ability to capture and analyze all customer interactions, generate appropriate responses, and gather data to create and build effective and efficient marketing campaigns

*Analysis:* The ability to analyze customer data to identify ways to increase revenue and decrease costs, identify the source of the firm's "best customers," and determine how to retain them and find even more of them

#### **4.10.3 Financial and Managerial Accounting**

The general ledger is the main accounting record of a business. It is often divided into different categories, including assets, liabilities, revenue, expenses, and equity. These categories, in turn, are subdivided into subledgers to capture details such as cash, accounts payable, accountsreceivable, and so on. In an ERP system, input to the general ledger occurs simultaneously with the input of a business transaction to a specific module. Here are several examples of how this occurs.

## **Chapter summery**

Information technology which are useful for a variety of business functions (transaction processing, management information, decision support, and so on) that support the business functions of accounting, finance, marketing, operations management, and human resource management.

accounting systems emphasize legal and historical record-keeping and the production of accurate financial statements. Typically, these systems include transaction processing systems such as order processing, inventory control, accounts receivable, accounts payable, payroll, and general ledger systems. Here in AIS information technologies such as hardware equipment's, software, communication devices are highly feasible in cost, time, satisfaction and other positive organizational outcomes.

Current IT is also important in execution of major marketing tasks through internet/intranet its possible where customers can become partners in creating, marketing, purchasing, and improving products and services in automated manner.

The function of production/operations is becoming highly integrated with contemporary technologies such as CAD, CIM, ERP and CAE. Information technologies which used for operations management and transaction processing are provide support for all firms that must plan, monitor, and control inventories, purchases, and the flow of goods and services.

Intranet technologies allow companies to process most common HRM applications over their corporate intranets. Intranets allow the HRM department to provide around-the-clock services to their customers: the employees. Intranets can collect information online from employees for input to their HRM files, and they can enable managers and other employees to perform HRM tasks with the help of information technologies.

Transactions are events that occur as part of doing business, such as sales, purchases, deposits, withdrawals, refunds, and payments. Online transaction processing systems play a strategic role in Web-enabled businesses. Many firms are using the Internet and other networks that tie them electronically to their customers or suppliers for online transaction processing (OLTP).

managers and business professionals during the decision-making process use decision support systems such as analytical models, specialized databases, a decision maker's own insights and judgments, and an interactive, computer-based modeling process to support semi-structured business decisions.

## Exercise questions

1. Which of the following is *not* one of the basic components of a TPS? a. databases b. networks c. procedures d. analytical models
2. The amount of support for decision making that a TPS directly provides managers and workers is low. True or False?
3. Management information system is more specific than decision support system? True or false
4. DSS software contains: A. what if analysis      B. What-if analysis
5. .... is a system which is helpful to automate the production process?
  - a. decision support system      b. computer integrated manufacturing
  - c. marketing information system      d. human resource information system
6. which one of the following is different from the other?
  - a. MES      b. process control      c. machine control      e. none
7. Which of the following is the basic components of a transaction processing system?
  - a. databases      b. networks      c. procedures      d. analytical models
8. Identify at least three ways a TPS can provide a firm with a competitive advantage?-----  
-----.
9. What sort of benefits should the suppliers and customers of a firm that has successfully implemented an ERP system to provide value to customer?-----  
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## CHAPTER FIVE

### 5.1 KNOWLEDGE MANAGEMENT

#### 5.2 Chapter Objective

Dear learner, welcome to the fifth chapter of your module of management information system! In this chapter, you will learn the management of knowledge, what it means KM, theories of KM, KM sharing, technologies to support KM and applications of KM in business organizations. To realize the essence of this chapter you have to read each section with curiosity.

Dear learner After studying this chapter, you have capable to did the following:

- Understand knowledge management

- Understand the theories of knowledge management

  - Understand the implications technologies in knowledge

  - managements Understand the applications of IT in decision making

- Understand the application of KM in business management

#### 5.3 Introduction

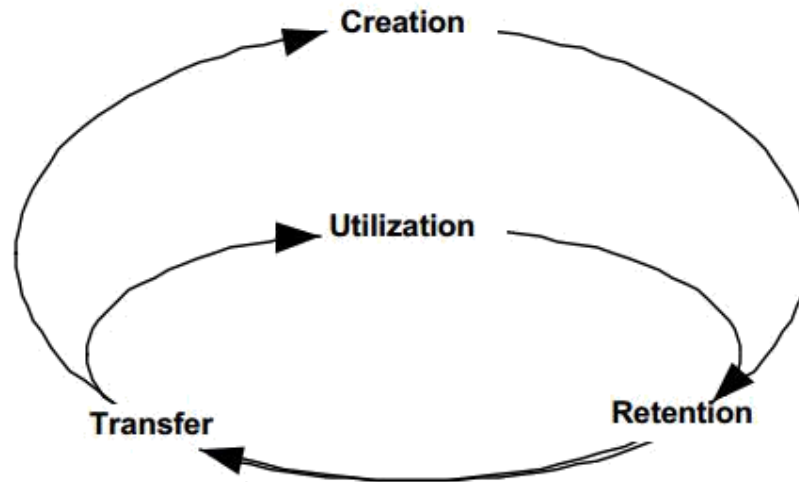
The ability to manage knowledge has become increasingly important in today's knowledge economy. Knowledge is considered a valuable commodity, embedded in products and in the tacit knowledge of highly mobile individual employees. **Knowledge management (KM)** represents a deliberate and systematic approach to cultivating and sharing an organization's knowledge base. It is a highly multidisciplinary field that encompasses both IT and intellectual capital. There are many definitions of KM. A common definition is *'the collection of processes that govern the creation, dissemination, and leveraging of knowledge to fulfill organizational objectives.'* "KM is a business philosophy. It is an emerging set of principles; processes, organizational structures, and technology applications that help people share and leverage their knowledge to meet their business objectives." This puts focus and responsibility on the individual – the knowledge worker - and on the holistic nature of KM. Also, critically it is about meeting business objectives. KM is not an end in its self. It is also fundamentally about sharing knowledge and putting that knowledge to use.

## **5.4 Knowledge Management Systems (KMS)**

Knowledge management systems are knowledge-based information systems that support the creation, organization, and dissemination of business knowledge to employees and managers throughout a company. Examples: intranet access to best business practices, sales proposal strategies, and customer problem resolution systems. Many companies are building KMS to manage organizational learning and business know-how. The goal of such systems is to help knowledge workers create, organize, and make available important business knowledge, wherever and whenever it's needed in an organization. This information includes processes, procedures, patents, reference works, formulas, best practices, forecasts, and fixes. Internet and intranet Web sites, groupware, data mining, knowledge bases, and online discussion groups are some of the key technologies that may be used by a KMS.

KMS also facilitate knowledge creation, it designed to provide rapid feedback to knowledge workers, encourage behavior changes by employees, and significantly improve business performance. As the organizational learning process continues and its knowledgebase expands, the knowledge-creating company works to integrate its knowledge into its business processes, products, and services. This integration helps the company become a more innovative and agile provider of high-quality products and customer services, as well as a formidable competitor in the marketplace.

In many organizations, hypermedia databases at corporate intranet Web sites have become the knowledge bases for storage and dissemination of business knowledge. This knowledge frequently takes the form of best practices, policies, and business solutions at the project, team, business unit, and enterprise levels of the company.



**Figure 5.1 The General Knowledge Model**

**Knowledge Creation.** This comprises activities associated with the entry of new knowledge into the system, and includes knowledge development, discovery and capture.

**Knowledge Retention.** This includes all activities that preserve knowledge and allow it to remain in the system once introduced. It also includes those activities that maintain the viability of knowledge within the system.

**Knowledge Transfer.** This refers to activities associated with the flow of knowledge from one party to another. This includes communication, translation, conversion, filtering and rendering.

**Knowledge Utilization.** This includes the activities and events connected with the application of knowledge to business processes.

#### **5.4.1 Elements of Knowledge Management**


How do organizations transform their current structure and processes to become learning organizations that leverage knowledge management? Marquardt (1996) provides some insight into these knowledge management elements:

- ⊕ ***Collaboration and the ability to connect individuals or groups:*** Everyone in organizations should be encouraged to gather data through the Internet, various media, internal data management systems, and socialization with peers and co-workers and to share this information across the organization. For example, some organizations may hold rallies in which teams and individual employees are

encouraged to share ideas as well as strategic reviews, system audits, internal benchmarking reports, and symposiums that bring together customers, suppliers, internal groups, and external experts to share ideas and learn from one another.

- ⊕ ***Nature of expertise and access to experts:*** Many organizations encourage team mixing and job rotations to facilitate transferring knowledge across boundaries by having people or teams possessing knowledge work with other groups or departments. This approach facilitates sharing new approaches and perceptions that new people bring to a situation. As Marquardt points out, “He or she is more likely to raise the ‘dumb questions’ that lead to new insight about how to handle a problem.”
- ⊕ ***Communities of practice enable employees to access specific groups to post issues, solve problems, or discuss key topics:*** A community of practice generally means a group of people who share a common interest in an area of competence and are willing to share the experiences of their practice. Many organizations encourage people to gather data that might benefit the organization. One channel for gaining this knowledge is communities of practice, which may be groups that meet formally, web boards where questions and answers are posted and other types of collaboration tools, such as message and chat boards. For example, a group of scientists on a LAN may collaborate, share notes, and raise questions.
- ⊕ ***Knowledge networking connects groups of people with systems and applications:*** For knowledge management to work, data and information must be captured in a system or central repository. This information must be coded a certain way so that it makes sense to employees trying to search for and access it. Organizations must decide the value of data and the system used to codify this information. The stored knowledge should be readily accessible to everyone in the organization and made available in a logical manner—for example, by topical categories and key words.
- ⊕ ***Making real-time information available to people who need it, when they need it:*** The key concept in knowledge management is providing information to the right people, in the right format, and in the right period of time. Many decisions have a time element attached to them, and information that’s not readily available to provide insight may mean a missed opportunity to make the right decision. Systems must be readily accessible for employees to search for and access key information when it’s needed.

- ⊕ **Knowledge of organization depth and scope:** Many organizations collect volumes of data, but unless it's coded and stored in a way that makes sense to employees and is retrievable, it's just volumes of data. Organizations need to determine what data to capture, how to capture it, and the format for providing information for employees to analyze it and make decisions.
- ⊕ **Personalization and navigation of the system and interface:** In many organizations, employees aren't computer savvy. As a result, they may not be fully aware of the importance of retaining this data and entering it into a centralized system. For employees trying to retrieve data from a knowledge management system, ease of use and ability to quickly access the exact information they need enhances employees' compliance to enter and access data from a centralized system.



Reflective activity

1. What are the contributions of knowledge management for the firm's competitiveness? -----  
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-----.

## 5.4.2 Basic concepts of Knowledge Management

KM is the combination of organizational culture, strategic goals, individual needs, and the expertise of its people to create an atmosphere of learning and growth. Philosophically, KM must be a vital part of corporate principles and individual jobs for knowledge sharing to succeed. It's through its conceptual components that knowledge management becomes legitimate.

### 5.4.2.1 Information versus Instruction

Information management is key in every organization. There are two primary traditions of providing essential information: *instruction* and *sharing*.

**Instruction** is information that's taught. When a learning need requires instruction, training is provided. Instruction may include information incorporating corporate ideals, expectations, safety, and related materials and can be delivered via classroom instruction, e-learning, and on-the-job training. **Information sharing** can be done

informally or formally. When a learning need is more appropriately addressed with information, knowledge management may be the solution. Information sharing and knowledge management occur in organizations that encourage sharing information and use collaboration, mentoring, and socialization to inform people. This information sharing can be done at the workstation, in meetings, or as issues happen.

A key difference in information and instruction Information is data that has been given meaning. Organizations that encourage sharing information use collaboration, mentoring, and socialization to inform people. This can be done at workstations, in meetings, or as issues happen. Instruction is information that's taught or trained, for example, in on-the-job training or in classroom and web instruction. As Rosenberg (2001) points out, providing access to information enables employees to access the organization's collective wisdom. Although both instruction and information aid learning, they are different in many respects.

#### **5.4.2.2 Knowledge, Information and Data**

The building blocks for knowledge management include data, information, and knowledge, as:

- ☀ Data: The nature of data is raw and without context and can exist in any form, usable or not. For example, numbers in a spreadsheet are data.
- ☀ Information: Data that has been given meaning. Spreadsheets are often used to create information from a set of data, such as sales over a period of time, increases or decreases in sales, competitor trends, and so on.
- ☀ Knowledge: Information that when combined with understanding enables action. For example, a manager analyzing a declining sales trend may take action to identify issues and carry out strategies to change the trend.

Think of the relationship of data, information, and knowledge as a hierarchy. Data gets turned into information, which then provides knowledge on which decisions are based. The key for organizations to harness the power of knowledge management is to turn information into accessible and reusable knowledge.

**Knowledge, Information and Data:** Knowledge is often seen as a rich form of information. This differentiation however is not terribly helpful. A more useful definition of knowledge is that it is about *know-how* and *know-why*. A metaphor is that of a cake. An analysis of its molecular constituents is *data* – for most purposes

not very useful – you may not even be able to tell it were a cake. A list of ingredients is *information* – more useful – an experienced cook could probably make the cake the data has been given context. The recipe though would be *knowledge* – written knowledge - *explicit knowledge* – it tells you *how-to* make the cake. An inexperienced cook however, even with the recipe might not make a good cake. A person, though, with relevant knowledge, experience, and skill – knowledge in their heads - not easily written down *tacit knowledge* would almost certainly make an excellent cake from the recipe.

It is important to note that to make knowledge productive you need information. Knowing how to make a cake is not sufficient – you need the list of ingredients. And to decide what cake in formation the tastes of the consumers of the cake. Know-why is also important. If an ingredient of the cake was unavailable – knowing the purpose of that ingredient might help a knowledgeable cook substitute an alternative. In fact know-why is often more important than know-how as it allows you to be creative - to fall back on principles – to re-invent your know-how. ***So, what exactly is knowledge management?*** Knowledge management is the explicit and systematic management of intellectual capital and organizational knowledge as well as the associated processes of creating, gathering, organizing, retrieving, leveraging, and using intellectual capital for the purposes of improving organizations and the people in them. Through these processes, organizations capture and store data and information in a central or distributed electronic environment—often referred to as a **knowledge base**. Many organizations are using knowledge bases to turn tacit knowledge (individual know-how) into explicit knowledge (documented information, steps, and processes). As noted by Groff and Jones, turning tacit knowledge into explicit knowledge is one of the key functions of a knowledge management strategy.

#### **5.4.2.3 Goals of Knowledge Management**

An abundance of information is available on the Internet, some of it well organized and some of it not. The goal of knowledge management is the effective sharing of knowledge throughout an organization for the benefit of the organization or the individual. This includes orientation information to fit culture and skills specific to socialization knowledge. This information needs to prepare an individual for success and prepare the organization for successful outcomes. Knowledge management seeks to overcome the barriers in knowledge sharing, such as collaboration.

As Rosenberg points out, “Many KM systems are facilitated by Internet technologies. Yet despite the need for technology, knowledge management is as much about people, working relationships, and communication. Live teamwork, collaboration, and other forms of person to person interaction are essential to create the right balance between the information and the actions of people.”

#### 5.4.2.4 Enterprise Knowledge Portals

For many companies, enterprise information portals are the entry to corporate intranets that serve as their KMS. That’s why such portals are called enterprise knowledge portals by their vendors. Thus, enterprise knowledge portals play an essential role in helping companies use their intranets as knowledge management systems to share and disseminate knowledge in support of business decision making by managers and business professionals. Now let’s look at an example of a knowledge management system in business.

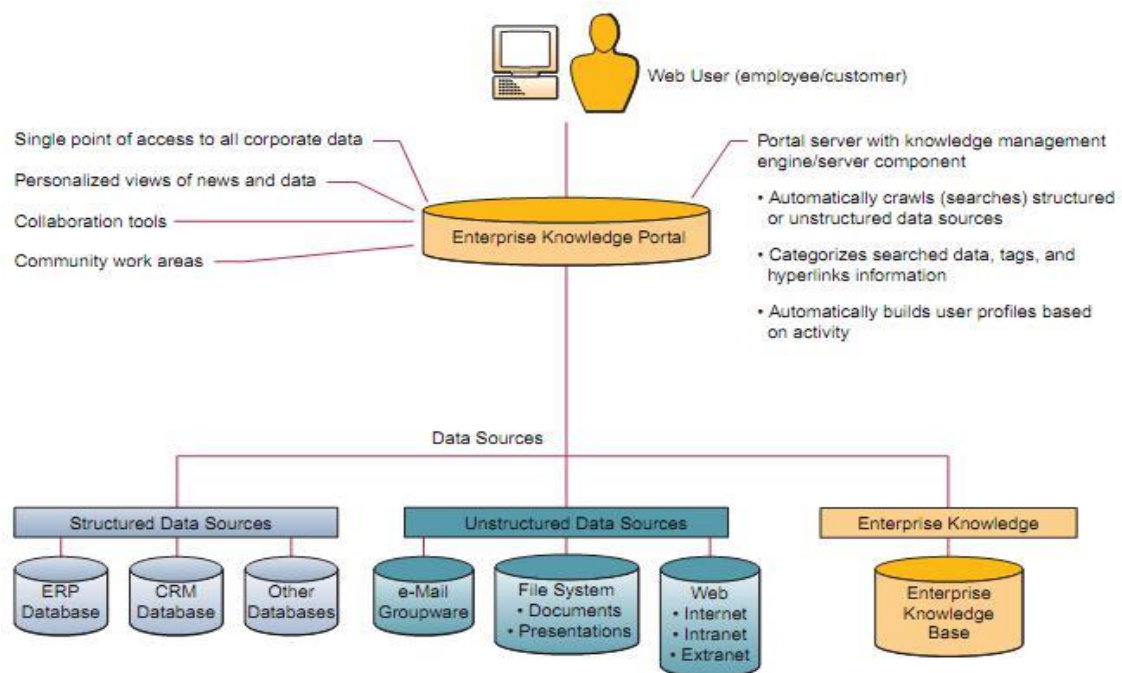


Figure 5.1 This example of the capabilities and components of an enterprise knowledge portal emphasizes its use as a Web-based knowledge management system.

## 5.5 Types of knowledge

**Explicit:** (also **expressive knowledge**) is knowledge that can be readily articulated, codified, stored and accessed. It can be easily transmitted to others. Most forms of explicit knowledge can be stored in certain media. The information contained in encyclopedias and textbooks are good examples of explicit knowledge. The most common forms of explicit knowledge are manuals, documents, procedures, and how-to videos. Knowledge also can be audio-visual. Engineering works and product design can be seen as other forms of explicit knowledge where human skills, motives and knowledge are externalized.

**Tacit:** This type of knowledge refers to personal knowledge in one's head—knowing how to do something based on experience. It includes judgment, insights, experience, know-how as well as personal beliefs and values. Tacit knowledge can often represent some of the most important information within an organization. Experienced employees of a company often “know” many things about how to manufacture a product, deliver the service, deal with a particular vendor, or operate an essential piece of equipment. This tacit knowledge is not recorded or codified anywhere because it has evolved in the employee's mind through years of experience. Furthermore, much of this tacit knowledge is never shared with anyone who might be in a position to record it in a more formal way because there is often little incentive to do so or simply, “Nobody ever asked.” For example, when conducting web-based training for the first time, a trainer can read documented information about how to conduct this training but at this point lacks tacit knowledge—the know-how based on previous experience.

Successful KM creates techniques, technologies, systems, and rewards for getting employees to share what they know and make better use of accumulated workplace and enterprise knowledge. In that way, employees of a company are leveraging knowledge as they do their jobs.

## 5.6 Theories of Knowledge Management

In the early 1990s, knowledge management emerged as a formal scientific discipline supported by scholars in academia, practitioners in corporate environments, and consultants. There are several methods and applications of knowledge management, and each approach varies by the scholar, author, or practitioner. The central

knowledge management theories are categorized as organizational, ecological, and techno-centric.

### **5.6.1 Organizational KM theory**

From the organizational perspective knowledge is based on knowledge systems that consist of a series of knowledge processes such as knowledge creation, storage, transfer and application with data, information, knowledge and wisdom as important factors (Ackoff, 1989; Berger & Luckman, 1996). Wisdom is acquired as organizational knowledge accumulates over time, enabling firms to attain deeper levels of understanding and knowledge through the transformation of collective experiences and expertise. New knowledge is introduced in the knowledge system through learning. The

ability for a knowledge system to acquire knowledge on its own is known as intelligence. So therefore, the primary focus of Organizational knowledge management theory is on the organizational structures and how an organization is designed culturally and hierarchically to manage knowledge and knowledge processes matter its KM success.

### **5.6.2 Ecological KM theory**

It tries to see from the social perspective, knowledge is created and inherent in the collective actions of a group of people working together and dependent on the social context where they belong. Knowledge ecology, community of practice and knowledge in networks are basic concepts in this social process (Berger & Luckmann, 1996; Brown & Duguid, 2000). McDermott (1999:105) dismiss the idea that knowledge is stuff “between the ears of the individual” and considers knowledge as belonging to communities. He claims that individuals learn by participating in communities full of knowledge and embody the ideas, perspectives, prejudices, languages and practices of that community. Discussions on communities of practice are elaborated in subsequent sections in the study. Here, the focus of this theory is on people, relationships, and learning communities, including interactions among individuals and organizations and the internal and external factors that draw people together to share knowledgematter its KM success.

### **5.6.3 Techno-centric theory**

The focus of Techno-centric theory focuses on technology and the process of designing technology enablers to help facilitate the flow of knowledge and the storage of information. Regardless of which theory of practice is deployed, knowledge management includes the impacts of people, process, and technology on knowledge sharing. More recently, development of social computing tools (such as blogs and wikis) have allowed more unstructured, self-governing or ecosystem approaches to the transfer, capture and creation of knowledge, including the development of new forms of communities, networks, or matrixed organizations. However, such tools for the most part are still based on text and code, and thus represent explicit knowledge transfer. These tools face challenges in distilling meaningful re-usable knowledge and ensuring that their content is transmissible through diverse channels.

### **5.7 Creating a Knowledge Sharing Culture**

Culture, according to Vijay Sathe is “the set of important understandings (often unstated) that members of a community share in common.” These shared understandings consist of our norms, values, attitudes, beliefs and ‘paradigms’. Another definition given in *Webster’s New Collegiate Dictionary*: “culture is the integrated pattern of human behavior that includes thought, speech, action, and artifacts and depends on man’s capacity for learning and transmitting knowledge to succeeding generations.” This second definition is an exciting one as increasing our capacity for learning and transmitting knowledge is one of the prime aims of Knowledge Management.

Organizational culture can be thought of as a relatively rigid tacit infrastructure of ideas that shape not only our thinking but also our behavior and perception of our business environment. It effectively establishes a set of guidelines by which members of an organization work and how those organizations are structured.

The concept of the paradigm is an extremely important one in understanding culture. A paradigm is a way of thinking, perceiving, communicating or viewing the world. It is often called a worldview or a mindset. The important point about a paradigm is that it is subconscious. We are not aware of our own paradigms.

## Why Sharing Knowledge is Important

Today, the creation and application of new knowledge is essential to the survival of almost all businesses. There are many reasons. They include: -

- Intangible products - ideas, processes, information are taking a growing share of global trade from the traditional, tangible goods of the manufacturing economy.
- Increasingly the only sustainable competitive advantage is continuous innovation. In other words, the application of new knowledge.
- Increasing turnover of staff: People don't take a job for life any more. When someone leaves an organization their knowledge walks out of the door with them. It makes the firm to identify and coordinate its informational resources: Our problem as an organization is that we don't know what we know. Large global or even small geographically dispersed organizations do not know what they know. Expertise learnt and applied in one part of the organization is not leveraged in another.
- Accelerating change - technology, business and social as things change so does our knowledge base erode – in some businesses, as much of 50% of what you knew 5 years ago is probably obsolete today.

### 5.7.1 Creating a Knowledge Sharing Culture

What then does it mean to create a Knowledge Sharing Culture?"

Knowledge sharing culture is about making knowledge sharing the norm. To create a knowledge sharing culture you need to encourage people to work together more effectively, to collaborate and to share - ultimately to make organizational knowledge more productive. The following issues are important to cultivate knowledge sharing culture in the organization:

**Rewarding Knowledge Sharing:** rewarding the contributor to encourage knowledge sharing. to encourage knowledge sharing, that an ideas database should be created and that people should be paid for their contributions - presumably regardless of quality or whether the ideas are brought to fruition.

**Motivating Knowledge Sharing:** The old paradigm was "knowledge is power". Today it needs to be explicitly understood that "sharing knowledge is power". If people understand that sharing their knowledge helps them to do their jobs more

effectively; helps them to retain their jobs; helps them in their personal development and career progression; rewards them for getting things done and brings more personal recognition, then knowledge sharing will become a reality. So, what are the reasons to share that should motivate people?

Here are a few: -

- ✦ Knowledge is a perishable. Knowledge is increasingly short-lived. If you do not make use of your knowledge then it rapidly loses its value. Even with the low level of knowledge sharing that goes on today – if you do not make your knowledge productive than someone else with that same knowledge will. You can almost guarantee that whatever bright idea you have someone else somewhere in the organization will be thinking along the same lines.
- ✦ By sharing your knowledge, you gain more than you lose. Sharing knowledge is a synergistic process – you get more out than you put in. If you share a product idea or a way of doing things with another person – then just the act of putting your idea into words or writing will help you shape and improve that idea. If you get into dialogue with the other person then you will benefit from their knowledge, from their unique insights and improve ideas further.
- ✦ To get most things done in an organization today requires a collaborative effort. If you try to work alone – you are likely to fail – you need not only the input from other people but their support and buy-in. Being open with them; sharing with them, helps you achieve your objectives.

**Overcoming the Objections:** Some people object to sharing as they feel that others will steal their ideas and reap the rewards rightly theirs. This is a fallacy. Knowledge sharing isn't about blindly sharing everything; giving away your ideas; being politically naïve; or being open about absolutely everything. You still need to exercise judgment. If you have a great idea – don't share it with a competitor – external or internal but on the other hand don't try to develop it on your own and don't sit on it for fear of it being stolen from you.

### **5.8 The Role of Technology in knowledge management**

Some people will argue that you do not need technology to implement a Knowledge Management program. To some extent they are right - Knowledge Management is fundamentally about people not technology. But there is absolutely no way that you

can share knowledge effectively within an organization even a small one or a large geographically dispersed one without using technology. Technology plays a crucial transformational role and is a key part of changing the corporate culture to knowledge sharing one. In many ways it is technology that has made knowledge sharing a reality in the past it was impossible to share knowledge or work collaboratively with co-workers around the globe.

Technology is not all good however. There are many pitfalls to its effective use. Information overload is one that comes readily to mind. Flaming wars (destructive heated electronic arguments) is another. Time wasting: browsing irrelevant stuff is yet another. If implemented well and if people are trained and educated in its use, knowledge sharing technology is good. Not only can you find the information and knowledge you need quickly and effectively but you can post your knowledge on the system for access by others in the organization. Additionally, groupware technology such as Lotus Notes/Domino working over the Internet, your organizational Intranet or Extranet allows you to work collaboratively with anyone anywhere in the world to achieve your objectives. Having this in mind the followings are major importance of ICT in managing knowledge:

**Role of ICT in Knowledge Capturing/Storage:** KM process is knowledge capturing. In this step, knowledge is acquired and encoded so that it can be easily stored. ICT empower information to be electronically captured/stored, accessed, delivered and retrieved for use of organizational decision making. ICT in an organization can benefit in building the organizational memory and knowledge that can provide the

**Role of ICT in Knowledge Creation:** ICT found to become more essential gears in knowledge creation. However, the creation of knowledge is primarily a human process; ICT provides tools used to facilitate knowledge creation process however, it cannot replace people (human). The role played by ICT in this process is to support and enhance the organizational processes of knowledge creation.

**Role of ICT in Knowledge Transferring:** ICTs are effective tools for transfer/sharing the knowledge with collaboration tools that allow people and teams which are geographically dispersed to communicate regardless geographical limitations. Moreover, are effective tools for improving outside communications, the

excellence of services for established and new customers, faster response time and information access. Furthermore, knowledge acquired as results of information possesses in the people's minds or people's experience and understanding and the role of technology is not making organization share/transfer knowledge, but to facilitate the range and opportunity of such exchanges, only if people want to share/transfer it.

### **5.9KM Application in Organizations**

Today's seemingly unlimited amounts of information like online news and blog posts, social media, email, research, reports, but also scores of open data and shared information has made knowledge an essential component of any business strategy. As a result, knowledge management applications are no longer a "nice to have" but a "must have" for any business that wants to thrive. To make the most of these applications requires a semantic technology that understands all the nuances of human communication and language. Having this let us see four commonly used knowledge management applications, that when powered by a cognitive technology, can transform your ability to take advantage of information:

**Intranet Search engine:** Being able to find what you need inside a company isn't always easy. Company intranets are an excellent starting point for making information available, but not every search box is equal. Accessing information often depends on users knowing where something is located (or who to call to find it). One of the most important knowledge management applications, therefore, is a strong, semantic search engine that can reach all of your enterprise content, and retrieve the precise items that you're looking for marketing reports, product data sheets, customer information, patent records, etc. with the same speed and effectiveness that you would expect from a typical internet search.

**Document classification based on customized taxonomy:** Simply storing the company knowledge is useless: Effective enterprise search, therefore, starts with deploying classification and taxonomy development tools rooted in an understanding of language. The taxonomy must reflect your organization's unique vocabulary—the acronyms, products and project code names that your internal users know by heart—in order to be truly useful; a full understanding of meaning can help distinguish between different contextual uses of information. Both are essential for delivering

precise information for search and other applications. For example, an energy company has its own language, which requires a specific and customized taxonomy that is able to associate content to the classes and nodes with great precision.

**Entity extraction:** Identifying entities contained in content, people, places, locations, organizations, as well as customized organizational entities can provide a useful view of unknown data sets by immediately revealing the who, what and where contained in your information. Entity extraction is an essential knowledge management application that helps transform unstructured data to data that is structured, and therefore machine readable and available for standard processing that can be applied for a number of business activities.

**Customer feedback analysis:** The opinions expressed online by your customers and users contain valuable insight about your companies, brands, competitors, products and services. Being able to analyze the signals and feedback left by consumers on social media, forums, reviews or classic survey mechanisms requires truly understanding what is being expressed and how. Semantic-powered knowledge management applications can cut through the slang, jargon and use of different languages to provide strategic value from customer feedback.

### **Essential Knowledge Management Tools**

Knowledge management tools have changed over the years. However, they still address the same basic needs. The following categories of tools are essential for any knowledge management practice:

**Content Repository:** are a Tools that allow users to manage and share knowledge content. For many years the dominant tool for knowledge management repositories was document management software. Today, most firms prefer tools that can manage diverse content (e.g. documents, web content, social content). For example, Content Management Systems (CMS), Enterprise Content Management (ECM) and Cloud Content Management (CCM).

**Knowledge Search:** A text search tool is often part of your content repository. For example, ECM usually has a search tool. Search is a critical function that improves the value of your knowledge. All search tools are not created equally. There's a big

difference in the performance of search solutions. Some firms invest in a search tool that can search across multiple sources of data (e.g. ECM and CRM).

**Communication Tool:** Tools that communicate knowledge and capture the knowledge generated by communication. This may include a variety of tools such as email, chat, instant messaging, telephone services (include VOIP), speech recognition, video conferencing and collaboration tools (e.g. whiteboards). Unified communications (UC) tools integrate communications into a single user experience.

**Social Software:** Tools that facilitate the socialization of knowledge. Social features are now commonly included in core enterprise software such as customer relationship management (CRM) and ERP.

**Knowledge Visualization:** Tools that are used to visually communicate knowledge. The vast majority of business knowledge is communicated with static 2D representations such as web pages and power point slides. There is great interest in dynamic, explorable, 3D representations of knowledge. A plethora of knowledge visualization tools have hit the market in recent years. The knowledge visualization market is still in its infancy but tools are maturing rapidly.

**Decision Support:** Tools that seek knowledge in large volumes of data. For example, analytics and reporting software that allows users to discover patterns of knowledge in data.

**Big Data:** Big data are a class of tools that store, manage and explore high velocity, variety and volume data. Firms use big data technologies to find knowledge in high volumes of structured (e.g. database tables) and unstructured data (e.g. documents, conversations).

## Summary of the chapter

KM is a business philosophy with emerging set of principles; processes, organizational structures, and technology applications that help people share and leverage their knowledge to meet their business objectives.

Knowledge management systems refer to any kind of IT system that stores and retrieves knowledge, improves collaboration, locates knowledge sources, mines repositories for hidden knowledge, captures and uses knowledge, or in some other way enhances the KM process.

A key difference in information and instruction Information is data that has been given meaning. Organizations that encourage sharing information use collaboration, mentoring, and socialization to inform people. This can be done at workstations, in meetings, or as issues happen. Instruction is information that's taught or trained, for example, in on-the-job training or in classroom and web instruction.

Think of the relationship of data, information, and knowledge as a hierarchy. Data gets turned into information, which then provides knowledge on which decisions are based. The key for organizations to harness the power of knowledge management is to turn information into accessible and reusable knowledge.

Tacit Knowledge is the knowledge your [co-worker or neighbor or associate] knows, but isn't codified or written down; while Explicit Knowledge deals with knowledge that is written down and structured.

The central knowledge management theories are categorized as organizational (how an organization is designed culturally and hierarchically to manage knowledge and knowledge processes), ecological (people, relationships, and learning communities, including interactions among individuals and organizations and the internal and external factors that draw people together to share knowledge), and techno-centric (technology and the process of designing technology enablers to help facilitate the flow of knowledge and the storage of information).

Knowledge management highly influenced by culture. Since culture is the integrated pattern of human behavior that includes thought, speech, action, and artifacts and depends on man's capacity for learning and transmitting knowledge to succeeding generations.

Technology plays a crucial transformational role and is a key part of changing the corporate culture to knowledge sharing one. In many ways it is technology that has

made knowledge sharing a reality in the past it was impossible to share knowledge or work collaboratively with co-workers around the globe.

Today's seemingly unlimited amounts of information like online news and blog posts, social media, email, research, reports, but also scores of open data and shared information has made knowledge an essential component of any business strategy. As a result, knowledge management applications are no longer a "nice to have" but a "must have" for any business that wants to thrive.

### **Exercise questions**

1. Which of the following statements do you agree with?
  - a. ICT should enable knowledge management strategy rather than drive it
  - b. ICT is not relevant to knowledge management strategy
  - c. The most important factor in a knowledge management strategy is ICT
  - d. ICT should be the starting point for a knowledge management strategy
  - e. Organizations should spend heavily in ICT to achieve knowledge management strategy success
2. What is the first step in knowledge management?
  - a. gathers
  - b. classifies
  - c. analyze
  - d. share
3. The process of finding, gathering, assessing, organizing, and sharing information is known as what?
  - a. Information management
  - b. Knowledge management
  - c. Information technology
  - d. Knowledge technology
4. Experience shared by an individual output in the
  - a. Codified knowledge
  - b. Shared knowledge
  - c. Tacit knowledge
  - d. Systematic knowledge
5. Explicit data is provided to address well-defined questions, by having
  - a. Informal information system
  - b. Formal information system
  - c. Direct Contact
  - d. Group meetings
6. What is knowledge?
  - a. Symbols, facts, numbers
  - b. Our experience
  - c. The application of data and information
  - d. Evaluated understanding
  - e. Data that has been processed

7. What are the main reasons of KM success in an organization?-----  
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8. Which solutions do you recommend be utilized in order to motivate and to increase the participation of people in KM?-----  
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9. Creating knowledge-driven culture is one of the most important challenges of KM implementation, what is your suggestion for tackling this problem?-----  
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10. What is your idea about trends and orientation of KM in 2017 and the near future?--  
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# **CHAPTER SIX**

## **SECURITY AND ETHICAL ISSUES IN MANAGEMENT INFORMATION SYSTEM**

### **6.1 Chapter Objective**

Dear learner, welcome to the last chapter of your module of management information system! In this chapter, you will learn the Security and Ethical Issues in Management Information System. To realize the essence of this chapter you have to read each section with curiosity.

After studying this chapter students will be able to:

- Identify different risks related to use of information system

- Identify ethical problems associated with management information system

- Explain security measures to be taken to safeguard computers and information resource from risks.

- Distinguish virus, worms and Trojan horses

### **6.2 Introduction**

Information Technology is can be used for productive or destructive purposes. Therefore, there is a need to be cautious of any harm that happens because of Information Technology. This chapter deals with different security problems associated with Information technology. It focuses on hard ware risk, software risks, data theft, identity theft, and the like. It also describes the risk of dawn time and related problems and how to protect the information system from such a risk. The chapter also IT security as related to computer virus, worms and Trojan horses. It also presents security problems caused by hackers and crackers. The chapter also discusses the on line security problems such as fraud, denial of service and the like. Ethical concerns of Information Technology are also presented. Different Security measures are also discussed.

### **6.3 Goals of Information Security**

The development, implementation, and maintenance of Information Systems constitute a large and growing part of the cost of doing business; protecting these resources is a primary concern. The increasing reliance on Information Systems,

combined with their connection to the outside world in the form of the Internet, makes securing corporate Information Systems increasingly challenging. What would happen if an enterprise wide system were infected with a virus and ceased operating? What would happen if a naughty employee accessed confidential data and sold them? How would illegal interception of information affect an organization that takes orders through the Internet? Needless to say, these questions highlight the potential for catastrophe if a system is not secure. The role of computer controls and security is to protect systems against these and many other accidents, as well as to help organizations ensure that their IS operations comply with the law and with expectations of employees and customers for privacy. The major goals of information security are:

- To reduce the risk of systems and organizations ceasing operations
- To maintain information confidentiality

- To ensure the integrity and reliability of data resources

- To ensure the uninterrupted availability of data resources and online operations

- To ensure compliance with policies and laws regarding security and privacy

These goals can be jeopardized in the ways indicated previously, perhaps most of all by the explosion of online activity over the Internet and the increasing use of intranets and extranets. To plan measures to support these goals, organizations first must be aware of the possible risks to their information resources, which include hardware, applications, data, and networks; then, they must execute security measures to defend against those risks.

#### **6.4 Information systems security**

Information security is the practice of protecting information by mitigating information risks. It is part of information risk management. It typically involves preventing or at least reducing the probability of unauthorized/inappropriate access, use, disclosure, disruption, deletion/destruction, corruption, modification, inspection, recording or devaluation, although it may also involve reducing the adverse impacts of incidents. Information may take any form, e.g. electronic or physical,<sup>[1]</sup> tangible (e.g. paperwork) or intangible (e.g. knowledge). Information security's primary focus

is the balanced protection of the confidentiality, integrity and availability of data (also known as the CIA triad) while maintaining a focus on efficient policy implementation, all without hampering organization productivity(Andress, 2014). This is largely achieved through a structured risk management process that involves:

- 📌 Identifying information and related assets, plus potential threats, vulnerabilities and impacts.
- 📌 Evaluating the risks.
- 📌 Deciding how to address or treat the risks.
- 📌 Where risk mitigation is required, selecting or designing appropriate security controls and implementing them.
- 📌 Monitoring the activities, making adjustments as necessary to address any issues, changes and improvement opportunities(Andress, 2014).

#### **6.4.1 Risks to Hardware**

While stories about damage caused to Information Systems by malicious Internet attacks are popular, the truth about risks to Information Systems is simpler. The number one cause of systems downtime is hardware failure. The next two contributors are fire and theft. Risks to hardware involve physical damage to computers, peripheral equipment, and communications media. The followings are the major causes of such risks in hardware:

**Natural Disasters:** Natural disasters that pose a risk to Information Systems include fires, floods, earthquakes, hurricanes, tornadoes, and lightning, which can destroy hardware, software, or both, causing total or partial paralysis of systems or communications lines.

**Blackouts and Brownouts:** Blackouts are total losses of electrical power. In brownouts, the voltage of the power decreases, or there are very short interruptions in the flow of power. Power failure may not only disrupt operations, but it can also cause irreparable damage to hardware. Occasional surges in voltage are equally harmful, because their impact on equipment is similar to that of lightning. The popular way of handling brownouts is to connect a voltage regulator between computers and the electric network. A voltage regulator boosts or decreases voltage to smooth out drops or surges and maintains voltage within an acceptable tolerance.

**Vandalism:** is the human beings' deliberate action to destroy computer systems. Bitter customers may damage ATMs, or disgruntled employees may destroy computer equipment out of fear that it will eliminate their jobs or simply to get even with their superiors. It is difficult to defend computers against vandalism. ATMs and other equipment that are accessible to the public are often covered in metal boxes, but someone with persistence can still cause severe damage. In the workplace, the best measure against vandalism is to allow access only to those who have a real need for the system. Sensitive equipment, such as servers, should be locked in a special room. Such rooms usually are well equipped with fire suppression systems and are air-conditioned, and thus protect also against environmental risks.

#### **6.4.2 Risks to Applications and Data**

The major risks to software applications and data are theft of information; data alteration, destruction, and defacement; computer viruses, worms, and logic bombs; and non-malicious mishaps.

**Theft of Information:** Now even the most sensitive information is usually stored electronically somewhere on a company's information system. Today's electronic equivalent of the physical key is a code, a combination of characters that is needed to access secured data. Before the computer age, large amounts of data meant a lot of paper, which was awkward to steal and awkward to hide when stolen. In most cases, data are stolen from corporate databases connected to the Internet. Such data are often personal data or lists of credit-card account numbers. In both cases, more than personal privacy may be violated. Thieves of personal information sometimes open bank and credit-card accounts with the data, and then charge the accounts with telephone and online purchases. Stolen credit-card account numbers account for fraudulent charges of hundreds of millions of dollars annually in the United States alone.

Sometimes the negligence of corporations and the careless use of technology, especially on public links to the Internet, create security "holes" or vulnerabilities. The followings are common techniques made by the wrongdoer:

**Social Engineering and Identity Theft:** In some cases, it is employees who willingly give away important information such as access codes. Con artists use

tricks known as social engineering. They telephone an employee who has a password to access an application or a database, introduce themselves as service people from a telephone company, or the organization's own IT unit, and say they must have the employee's password to fix a problem. Employees are often tempted to provide their password. The "social engineers" then steal valuable information. Once criminals have a person's identifying details, such as a Social Security number, driver's license number, or credit-card number, they can pretend to be this person. This crime is called identity theft. The pretender can easily withdraw money from the victim's bank accounts, put charges on the victim's credit card, and apply for new credit cards.

**Data Alteration, Data Destruction, and Web Defacement:** Alteration or destruction of data is often an act of mischief. Data alteration is not a new phenomenon, Since organizations started establishing Web sites, hackers-people who access information systems without permission-have had a new target: in their Web pages Each day, some organizations find their Web sites have been defaced. In the best-case scenario, Web defacement is the cyber-equivalent of street graffiti someone adds offensive text or pictures to the page. In the worst-case scenario, pages are totally replaced with offensive content. The best measure against defacement, of course, is software that protects against unauthorized access. However, since such software may fail, the public damage may be minimized by ensuring that some members of the organization monitor the home page and other essential pages frequently. When the defacement is detected shortly after it occurs, the defaced pages can be replaced with the original ones before too many visitors have seen the rogue pages.

**Computer Viruses, Worms, and Logic Bombs:** it is similar with the nature of biological virus which are a microorganism that attacks the living cells of a host, such as a human being or another animal. It penetrates the cells, multiplies, and then causes the cells to burst, thereby destroying them. It is rapidly transmitted from one living creature to another. Computer viruses are usually a few lines of programming code that are inserted in a legitimate program that is later copied and activated by unwary users. Computer viruses are so named because they act on programs and data in a fashion similar to the way viruses act on living tissue:

computer viruses easily spread from computer to computer. Because so many computers are now connected to one another and many people share files, people unknowingly transmit to other computers viruses that have infected their own files. Once a virus reaches a computer, it damages applications and data files. In addition to destroying legitimate applications and data files, viruses may disrupt data communications. The presence of viruses causes data communications applications to process huge numbers of messages and files for no useful purpose, which detracts from the efficiency of transmitting and receiving legitimate messages and files. The only difference between a computer virus and a worm is that a worm spreads in a network without human intervention. A worm attacks computers without the need to send e-mail or open any received files. Most people refer to both types of rogue code as virus.

viruses spread in a similar way just the recipient is tempted to open-and thereby activate-a file that is attached to a message. The program in that file then destroys files, slows down operations, or does both, and uses vulnerabilities in the operating system and other applications to launch copies of itself to other computers linked to the Internet.

Like other worms, Blaster spread through networks without human intervention. It does not require launching and opening e-mail attachments. Once reaching a computer, it scans a network and spreads to other computers connected to the infected one. This is why the most vulnerable computers were those constantly linked to the Internet through broadband connections. Some viruses do not affect any files, but the speed at which they spread and their repeated attacks slow down network traffic to an intolerable crawl.

A logic bomb is software that is programmed to cause damage at a specified time to specific applications and data files. It lies dormant until a certain event takes place in the computer or until the computer's inner clock reaches the specified time; the event or time triggers the virus to start causing damage. Logic bombs are usually planted by insiders, that is, employees of the victimized organization.

One way to protect against viruses is to use antivirus software, which is readily available on the market from companies that specialize in developing this kind of

software, such as Symantec and McAfee. Subscribers can regularly update the software with code that identifies and deletes or quarantines new viruses. According to Symantec, the majority of the computers that were infected with the Blaster worm were owned by individuals, not corporations. Unlike corporations, many individuals do not use antivirus applications.

**Non-malicious Mishaps:** Unintentional damage to software occurs because of poor training, lack of adherence to simple backup procedures, or simple human error. Although unintentional damage rarely occurs in robust applications, poor training may result in inappropriate use of an application so that it ruins data, unbeknownst to the user. For instance, when faced with an instruction that may change or delete data, a robust application will pose a question such as: "Are you sure you want to delete the record?" or Issue a warning such as "This may destroy the file. More common damage is caused by the failure to save all work and create a backup copy. Destruction of data often happens when using a word-processing program to create text files and when updating databases.

#### **6.4.3 Risks to Online Operations**

The massive movement of operations to the Internet has attracted through hackers who try to interrupt such operations daily. In addition to unauthorized access, data theft, and defacing of Web pages, there has been a surge in denial-of-service attacks and hijacking of computers.

**Denial of Service (DoS):** occurs when too many requests are received to log on to a Web site's pages. The intention of such log-in requests is to slow down legitimate traffic on the site's server; business can slow to a halt. Multiple log-in requests may be perpetrated by a single person who uses specially designed software that automatically repeats requests for a long period of time. The server's or servers' frantic efforts to handle the massive amount of traffic denies legitimate visitors and business partners access to the site, and hence its name.

When managers realize that their site is being attacked, they usually shut it down for several hours, hoping that the attackers will get discouraged and go away. Network professionals can also try to detect the IP addresses from

which a large number of requests are coming and program the server not to accept any requests from that particular server. However, blocking requests may also deny access to legitimate visitors, especially if the server is used by an ISP who provides Internet access to thousands of people and organizations. One way to mitigate DoS attacks is for an organization to use multiple servers, which is a good idea anyway to handle times of legitimate traffic increases.

**Hijacking:** Hijacking a computer means using some or all of the resources of a computer linked to a public network without the consent of its owner. The damage to corporations may be great in the form of reduced productivity. The main purpose of hijacking computers is spamming: using hijacked computers to send unsolicited commercial e-mail to large numbers of people, often millions of addresses. Spammers do so for two reasons: they hide the real source of the e-mail so that they cannot be identified and pursued, and they take advantage of the hijacked machines' computer resources-CPU time, memory, and communications link-to expedite the distribution of spam. The main targets are corporate and household computers with fast Internet connections shared by two or more computers.

**Spoofing:** Imagine that someone hung a sign above the entrance to your store in a busy mall telling shoppers the store was closed and sending them to a competing store. For several hours you are not aware of the sign. When the equivalent happens on the Web, the act is called spoofing. Spoofing on the Internet may mean satirizing a Web site. But in recent years spoofing has also come to mean deception for the purpose of gaining access, or deception of users to make them think they are logged on to a certain Web site while they actually are logged on to another, or that an e-mail message they received comes from another Web site.

Most spoofing attacks are designed to embarrass organizations, but security experts worry that spoofing techniques may take a more sinister angle: a serious spoofing attack may result in massive fraud. During spoofing, the perpetrator takes advantage of certain vulnerabilities in domain name system (DNS) software. When a user types a domain name into his or her browser, the local DNS server sends a query through the Internet's distributed

hierarchical DNS to look up the matching IP address for that domain name. Spoolers' manipulate the DNS software so that the path to the IP address is redirected; visitors believe they are connected to the requested server when in fact they are connected to another. This interception and redirection is akin to someone switching your name with someone else's in a telephone directory so you receive all that person's calls.

Pay attention to the following tips from the FBI to protect against falling victim to spoofing.

#### FBI tips for Internet users

If you encounter an unsolicited e-mail that asks you, either directly or through a Web site, for personal financial or identity information, such as Social Security number, passwords, or other identifiers, exercise extreme caution.

If you need to update your information online, use the normal process you've used before, or open a new browser window and type in the Web site address of the legitimate company's account maintenance page.

If a Web site address is unfamiliar, it's probably not real. Only use the address that you have used before, or start at your normal home page.

Always report fraudulent or suspicious e-mail to your ISP. Reporting instances of spoof Web sites will help get these bogus Web sites shut down before they can do any more harm.

Most companies require you to log in to a secure site. Look for the lock at the bottom of your browser and "https" in front of the Web site address.

Take note of the header address on the Web site. Most legitimate sites will have a relatively short Internet address that usually depicts the business name followed by ".com," or possibly ".org." Spoof sites are more likely to have an excessively long string of characters in the header, with the legitimate business name somewhere in the string, or possibly not at all.

If you have any doubts about an e-mail or Web site, contact the legitimate company directly. Make a copy of the questionable Web site's URL address, send it to the legitimate business, and ask if the request is legitimate.

If you've been victimized by a spoofed e-mail or Web site, you should contact your local police or sheriff's department" and file a complaint with the FBI's Internet Fraud Complaint Center.

#### 6.4.4 Controlling risks

The following are the most common controls to protect computers from risks.

**Program Robustness and Data Entry Controls:** A computer program is said to be "robust" if it is free of bugs and can handle unforeseen situations well. While programmers' debate whether any software can be fully bug free, they can develop software so that it does not lock up the computer, cause damage to files, or display dialog boxes that do not help the users fix the problem. Robust applications can resist inappropriate usage, such as incorrect data entry or processing. An application can be written with different levels of robustness, depending on the developers' expectations about the way the program will be used. The least robust program assumes that the user is experienced and will enter only parameters that are expected of him or her. The most robust program considers every possible misuse or abuse. A highly robust program includes code that promptly produces a clear message if a user either errs or tries to circumvent a process.

For example, a system programmed to accept telephone numbers may have a number of controls built into it. Say the phone numbers should be input only in a certain format, such as 10 digits (3-digit area code followed by 3-digit exchange and 4-digit phone number). If a user enters a 7 -digit or 11 -digit number, a system with data entry controls might display an error message, such as "You must enter a 10-digit number."

**Backup:** Probably the easiest way to protect against loss of data caused by natural disasters, computer viruses, or human errors is to automatically duplicate all data periodically, a process referred to as data backup. Many systems have built-in automatic backup programs. The data may be duplicated on inexpensive storage devices such as magnetic tapes. Manufacturers of storage devices also offer Redundant Arrays of Independent Disks (RAID) for this purpose. RAID is a set of disks that is programmed to redundantly store data to provide a higher degree of reliability. Of course, backing up data is not enough. The disks or tapes with backed up data must be routinely transported off-site, so that if a business site is damaged by a disaster, the remote storage can be used since it is likely to be spared

**Atomic Transactions:**As you know, in an efficient IS, a user enters data only once, and the data are recorded in different files for different purposes, according to the system's programmed instructions. For instance, in a typical order system, a sale is recorded in several files: the shipping file (so that the warehouse knows what to pack and ship), the invoice file (to produce an invoice and keep a copy in the system), the accounts receivable file (for accounting purposes), and the commission file (so that the salesperson can be compensated with the appropriate commission fee at the end of the month). A system supports atomic transactions when its code only allows the recording of data if they successfully reach all their many destinations. An atomic is a set of indivisible transactions that are either all executed or none are-never only some. Using atomic transactions ensures that only full entry occurs in all the appropriate files.

Note that this is a control not only against a malfunction but also against fraud. Suppose the salesperson collaborates with the clerk to enter the sale only in the commission file, so he or she can be rewarded for a sale that has never taken place- and then plans to split the fee with the clerk. The atomic transactions control would not let this happen.

**Audit Trail:**In spite of the steps taken to prevent system abuse, it nonetheless occurs. Consequently, further steps are needed to track transactions so that (1) when abuses are found, they can be traced, and (2) fear of detection indirectly discourages abuse. One popular tracking tool is the audit trail: a series of documented facts that help detect who recorded which transactions, at what time, and under whose approval. Whenever an employee records a transaction, such a system prompts the employee to provide certain information: an invoice number, account number, salesperson ID number, and the like. Sometimes an audit trail is automatically created using data, such as the date and time of a transaction or the name or password of the user updating the file. These data are recorded directly from the computer often unbeknownst to the user-and attached to the record of the transaction.

Audit trail information helps uncover undesirable acts, from innocent mistakes to premeditated fraud. The information helps determine who authorized and/or made the entries, the date and time of the transactions, and other identifying data that are

essential in correcting mistakes or recovering losses. The audit trail is the most important tool of the information systems auditor (formerly known as the electronic data processing auditor), the professional whose job it is to find erroneous or fraudulent cases and investigate them.

#### **6.4.5 Security Measures**

The great increase in the number of people and organizations using the Internet, and especially Web sites, has provided fertile ground for unauthorized and destructive activity. This section describes several ways that organizations can protect themselves against such attacks:

**Firewalls:** The best defense against unauthorized access to systems over the Internet is a firewall, which is software that blocks access to computing resources. Firewall software screens the activities of a person who logs on to a Web site; it allows retrieval and viewing of certain material, but blocks attempts to change the information or to access other resources that reside on the same computer or computers connected to it.

It is important to note that while firewalls are used to keep unauthorized users out, they are also used to keep unauthorized software or instructions away, such as computer viruses and other rogue software. When an employee uses a company computer to access external Web sites, the firewall screens for viruses and active attempts to invade company resources through the open communications line. It may also be programmed to block employee access to sites that are suspected of launching rogue programs, or to sites that provide no useful resources. The firewall then prohibits the user from logging on to those sites.

**Authentication and Encryption:** Authentication is the process of ensuring that the person who sends a message to or receives a message from you is indeed that person. Authentication can be accomplished by senders and receivers exchanging codes known only to them. Once authentication is established, keeping a message secret, too, can be accomplished by transforming it into a form that cannot be read by anyone who intercepts it. Coding a message into a form unreadable to an interceptor is called encryption.

The parties can use encryption programs and scramble information which are transmitted over network so that an interceptor only receives jumbled data. The original message is called plaintext; the coded message is called cipher text. Encryption uses a mathematical algorithm, which is a formula, and a key. The key is a combination of bits that must be used to figure out the formula. The receiving computer uses the key to activate the algorithm that translates the cipher text back into plaintext.

**Pretty Good Privacy:** In most business-to-consumer transactions, only the merchant holds a digital certificate, so the visitor can authenticate the merchant. A digital certificate is a file that verifies the holder's identity; it must be purchased. Most individuals do not hold digital certificates. When you use your browser to send encrypted messages, the browser finds the recipient's public key. But what happens if the merchant wants to send you an encrypted message, or if you want to communicate encrypted messages with another individual? Parties that wish to use this method need access to a global registry of public keys. Such registries are now available on the Web. There are several public-key applications, one of which is called Pretty Good Privacy (PGP). If two individuals wish to encrypt their messages, they can purchase a program such as PGP (Pretty Good Privacy) and apply for their public and private keys. You register the public key that the program gives you with a PGP public-key server so that people who want to communicate with you can find your public key.

**Digital Signatures and Digital Certificates:** With the increasing use of e-commerce for all types of business, transactions came the pressure to allow legally binding transactions online. Some countries have now broken that barrier and recognized the legal validity of electronic signatures. In order for electronic signatures to be commercially viable, there must also be a way to ensure their authenticity, which is where digital signatures and digital certificates come in.

#### **6.4.6 The Downside of Security Measures**

Security measures—especially passwords, encryption applications, and firewalls have a price that relates to more than money: they slow down data communications, and they require user discipline, which is not always easy to maintain. Employees tend to forget their passwords, especially if they must replace them every 30 or 90 days. To

remember their passwords, many employees write them on a piece of paper and keep them where they are most likely to need them: taped to their computers. Any office visitor can see many of these little notes on computers in cubicles.

Employees are especially annoyed when they have to use a different password for every system they use; in some companies, there may be four or five different systems, each with its own access control. A simpler solution is an approach called SSO (single sign-on). With SSO, users are required to identify themselves only once before accessing several different systems. However, SSO requires special software that interacts with all the systems in an organization, and the systems must be linked through a network. Not many organizations have installed such software.

Encryption slows down communication because the software must encrypt and decrypt every message. Remember that when you use a secure Web site, much of the information you view on your screen was encrypted by the software installed on the site's server and then decrypted by your browser. All this activity takes time, and the delay only exacerbates the Internet's low download speed during periods of heavy traffic.

Firewalls have the same slowing effect; screening every download takes time, which affects anyone trying to access information, including employees, business partners, and individual consumers. Customers may become frustrated if they have to wait too long for response from a Web site. They may turn away and decide to shop and buy at a competitor's site. Business partners may complain about inconvenience.

IT specialists must clearly explain to managers the implications of applying security measures, especially on systems connected to the Internet. The IT specialists and other managers must first determine which resource should be accessed only with passwords and which also require other screening methods, such as firewalls. They must tell employees what impact a new security measure will have on their daily work, and if the measure will adversely affect their work, the specialists must convince the employees that the inconvenience is the price for protecting data. The IT specialists should also continue to work on methods that minimize inconvenience and delays.

### **6.4.7 Recovery**

Security measures may reduce undesirable mishaps, but nobody can control all disasters. To be prepared for disasters when they do occur, organizations must have recovery measures in place. Organizations that depend heavily on Information Systems for their daily business often use redundancy; that is, they run all systems and transactions on two computers in parallel to protect against loss of data and business. If one computer is down, the work can continue on the other computer. Redundancy makes the system fault tolerant. However, in distributed systems, doubling every computing resource is extremely expensive, so other measures must be taken.

To prepare for mishaps, either natural or malicious, many organizations have well-planned programs in place, called business recovery plans or business continuity plans. The plans detail what should be done and by whom if critical Information Systems go down or if IS operations become untrustworthy. Business recovery plans deal mostly with steps to take when Information Systems are incapacitated.

#### **6.4.7.1 Business Recovery Plan**

Concern about disaster recovery has spread beyond banks, insurance companies, and data centers, the traditional disaster recovery fanatics. Many customer service and retail firms realize that they can easily lose customers if they don't deliver services and products in a timely manner, which is why the terms "business recovery," "business resumption," and "business continuity" have caught on in some circles. Experts propose nine steps to develop a business recovery plan:

1. Obtain management's commitment to the plan. Development of a recovery plan requires substantial resources. Top management must be convinced of the potential damages that paralysis of information systems may cause. Once management is committed, it should appoint a business recovery coordinator to develop the plan and execute it if disaster occurs.
2. Establish a planning committee. The coordinator establishes a planning committee comprising representatives from all business units that are dependent on computer-based Information Systems. The members serve as liaisons between the coordinator and their unit managers. The managers are authorized to establish emergency procedures for their own departments.

3. Perform risk assessment and impact analysis. The committee assesses which operations would be hurt by disasters, and how long the organization could continue to operate without the damaged resources. This analysis is carried out through interviews with managers of functional business areas. The committee compiles information regarding maximum allowable downtime, required backup information, and the financial, operational, and legal consequences of extended downtime.
4. Prioritize recovery needs. The disaster recovery coordinator ranks each IS application according to its effect on an organization's ability to achieve its mission. Mission-critical applications, those without which the business cannot conduct its operations, are given the highest priority. The largest or most widely used system may not be the most critical. Applications may be categorized into several classes, such as:
  - Critical: Applications that cannot be replaced with manual systems under any circumstances
  - Vital: Applications that can be replaced with manual systems for a brief period, such as several days
  - Sensitive: Applications that can be replaced with acceptable manual systems for an extended period of time, though at great cost
  - Noncritical: Applications that can be interrupted for an extended period of time at little or no cost to the organization
5. Select a recovery plan. Recovery plan alternatives are evaluated by considering advantages and disadvantages in terms of risk reduction, cost, and the speed at which employees can adjust to the alternative system.
6. Select vendors. If it is determined that an external vendor can better respond to a disaster than in-house staff and provide a better alternate system, then the most cost-effective external vendor should be selected. Factors considered should include the vendor's ability to provide telecommunications alternatives, experience, and capacity to support current applications.
7. Develop and implement the plan. The plan includes organizational and vendor responsibilities and the sequence of events that will take place. Each business unit is informed of its responsibilities, who the key contacts are in each department, and the training programs available for personnel.

8. Test the plan. Testing includes a walk-through with each business unit, simulations as if a real disaster had occurred, and (if no damage will be caused) a deliberate interruption of the system and implementation of the plan. In mock disasters, the coordinator measures the time it takes to implement the plan and its effectiveness.
9. Continually test and evaluate. The staff must be aware of the plan at all times. Therefore, the plan must be tested periodically. It should be evaluated in light of new business practices and the addition of new applications. If necessary, the plan should be modified to accommodate these changes.

The plan should include the key personnel and their responsibilities, as well as a procedure to reinstitute interactions with outside business partners and suppliers. Because an organization's priorities and environment change over time, the plan must be examined periodically and updated if necessary.

## **6.5 Ethics in MIS**

As you've seen throughout this book in the "Ethical and Societal Issues" boxes, ethical issues deal with what is generally considered right or wrong. As we have seen, laws do not provide

a complete guide to ethical behavior. Just because an activity is defined as legal does not mean that it is ethical. As a result, practitioners in many professions subscribe to a code of ethics that states the principles and core values that are essential to their work and, therefore, govern their behavior. The code can become a reference point for weighing what is legal and what is ethical.

Some IS professionals believe that their field offers many opportunities for unethical behavior. They also believe that unethical behavior can be reduced by top-level managers developing, discussing, and enforcing codes of ethics. Various IS-related organizations and associations promote ethically responsible use of information systems and have developed useful codes of ethics.

The Association for Computing Machinery (ACM) is the oldest computing society, founded in 1947, and boasts more than 80,000 members in more than 100 countries. The ACM has a code of ethics and professional conduct that includes eight general moral imperatives that can be used to help guide the actions of IS professionals.

These guidelines can also be used for those who employ or hire IS professionals to monitor and guide their work.

These imperatives are outlined in the following list: As an ACM member I will ...

- 🚩 Contribute to society and human well-being.
- 🚩 Avoid harm to others.
- 🚩 Be honest and trustworthy.
- 🚩 Be fair and take action not to discriminate.
- 🚩 Honor property rights including copyrights and patents.
- 🚩 Give proper credit for intellectual property.
- 🚩 Respect the privacy of others.
- 🚩 Honor confidentiality.

### **Summary of the chapter**

Information security means protecting information and information systems from unauthorized access, use, disclosure, disruption, modification or destruction.

Computer security can focus on ensuring the availability and correct operation of a computer system without concern for the information stored or processed by the computer.

Should confidential information about a business' customers or finances or new product line fall into the hands of a competitor, such a breach of security could lead to lost business, law suits or even bankruptcy of the business. Protecting confidential information is a business requirement, and in many cases also an ethical and legal requirement.

For the individual, information security has a significant effect on privacy, which is viewed very differently in different cultures.

In information security, integrity means that data cannot be modified without authorization. This is not the same thing as referential integrity in databases.

Integrity is violated when an employee accidentally or with malicious intent deletes important data files, when a computer virus infects a computer, when an employee is able to modify his own salary in a payroll database, when an unauthorized user vandalizes a web site, when someone is able to cast a very large number of votes in an online poll, and so on.

In computing, e-Business and information security it is necessary to ensure that the data, transactions, communications or documents (electronic or physical) are genuine. It is also important for authenticity to validate that both parties involved are who they claim they are.

practitioners in many professions subscribe to a code of ethics that states the principles and core values that are essential to their work and, therefore, govern their behavior. The code can become a reference point for weighing what is legal and what is ethical. Some IS professionals believe that their field offers many opportunities for unethical behavior.

To prepare for mishaps, either natural or malicious, many organizations have well-planned programs in place, called business recovery plans or business continuity plans. The plans detail what should be done and by whom if critical Information Systems go down or if IS operations become untrustworthy.

### Exercise Questions

1. ----- risk is involve physical damage to computers, peripheral equipment, and communications media.  
a. Natural disaster      b. theft      c. spoofing      d. logic bombs
2. ----- are total losses of electrical power where as in brownouts, the voltage of the power decreases, or there are very short interruptions in the flow of power.  
a. Blackouts and burnouts      b. natural disasters      c. Vandalism      e. none
3. ----- occurs when human beings deliberately destroy computer systems.  
a. Viruses      b. vandalism      c. social engineering      d. identity theft
4. ----- occurs when too many requests are received to log on to a Web site's pages
5. Probably the easiest way to protect against loss of data caused by natural disasters, computer viruses, or human errors is to automatically duplicate all data periodically, a process referred to as data -----
6. ----- is a series of documented facts that help detect who recorded which transactions, at what time, and under whose approval.  
\_\_\_\_\_ is the process of ensuring that the person who sends a message to or receives a message from you is indeed that person.
8. Mention some common types of control?-----  
-----  
-----
9. what are the importance's of ethics in MIS?-----  
-----  
-----

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## Appendix

**Arbaminch University**  
**College of Business and Economics**  
**Department of management**

### Module Assignment

**Course Name: Management Information Systems**

**Course Code: Mgmt 322**



Maximum mark 30%

### Personal Information

Name \_\_\_\_\_

ID \_\_\_\_\_

Centre: \_\_\_\_\_

### **Part one**

Multiple choice questions (1 pts each)

1. People who spend most of their working day creating, using, and distributing information are
  - A. industrial workers
  - B. agrarian worker
  - C. factory worker
  - D. knowledge worker
  - E. a and C
  - F. all
2. Reports produced at regular time interval are called
  - A. exceptional reports
  - B. demand reports
  - C. action reports
  - D. periodic scheduled reports
  - E. all
  - F. none
3. Being able to talk to computers and robots in conversational human language and have them understand is the goal of
  - A. cognitive science application
  - B. computer science application
  - C. robotics applications
  - D. natural interface application
  - E. all
  - F. none
4. Expert systems can
  - A. learn from experience
  - B. solve problems requiring a broad knowledge and subjective problem-solving abilities
  - C. capture the expertise of an expert in computer-based information system
  - D. make subjective managerial decisions effectively
  - E. all
  - F. none

5. Privacy on the Internet is a growing concern. When using the Internet for E-mail, which one of the following would NOT be used by individuals to protect their privacy:
  - A. Using Encryption techniques
  - B. Using anonymous re-mailers.
  - C. Declining to reveal personal data to online services.
  - D. Using cookie files.
  - E. All
  - F. None
6. Pick the odd from the following information system resources
  - A. computers
  - B. printers
  - C. programs
  - D. optical scanners
  - E. magnetic disks
  - F. none of the above
7. Data processing activity may include
  - A. aggregation, manipulation and organization
  - B. analysis and evaluation
  - C. placing the data in proper context
  - D. all
  - E. A and B
  - F. None of the above
8. Network within an organization that is used to share resources, data and collaboration of team members is referred to as
  - A. extranet
  - B. intranet
  - C. internet
  - D. A and B
  - E. All
  - F. None
9. Employees and external consultants on a project team may use the Internet, intranets, and extranets to support electronic mail, videoconferencing, electronic discussion groups, and multimedia web pages. Communicating and collaborating on business projects would be a typical example of:
  - A. Enterprise collaboration systems.
  - B. Electronic commerce systems.
  - C. Internal business systems.
  - D. Business process reengineering
  - E. All
  - F. None
10. Organizations commonly replicate and distribute copies or parts of databases to network servers at a variety of sites. These databases are referred to as:

- A. Operational databases.
  - B. Local databases.
  - C. Distributed databases.
  - D. External databases.
  - E. All
  - F. None
11. A logical grouping of characters is a:
- A. Character.
  - B. Field
  - C. Record.
  - D. File.
  - E. All
  - F. None
12. Which one of the following describes a unit of data that would be designated as a file?
- A. A student's social security number.
  - B. A student's name, social security number, and information about his or her academic performance last semester.
  - C. Names, social security numbers and housing assignments for all students living in dormitories.
  - D. Academic performance, personal history, housing, and automobile registration information for all students previously and currently enrolled.
  - E. All
  - F. None
13. The data manipulation tool that performs the same function as query-by-example, except that you perform the query by creating a statement instead of pointing, clicking, and dragging is
- A. A report generator.
  - B. A query-by-example tool.
  - C. Structured query language.
  - D. A and B
  - E. All
  - F. None
14. Which of the following is not among the major types of control?
- A. input control
  - B. processing control
  - C. output control
  - D. storage control
  - E. all
  - F. none
15. Computer generation that relies on the use of LSI (large scale integration) and VLSI (very large-scale integration) technologies that cram hundreds of thousands of transistors and other circuit elements on each chip is:
- A. first generation computing
  - B. second generation computing
  - C. third generation computing
  - D. fourth generation computing
  - E. fifth generation computing

- F. none
16. Which of the following is not microcomputer?
- |                       |                       |
|-----------------------|-----------------------|
| A. Personal computers | D. Notebook computers |
| B. Desktop computers  | E. All                |
| C. Laptop             | F. None               |
17. A type of computer system that are extremely powerful, designed for scientific, engineering and business application requiring extremely high speed for massive numeric computation is
- |                       |                        |
|-----------------------|------------------------|
| A. microcomputer      | D. mainframe computers |
| B. midrange computers | E. network computers   |
| C. supercomputers     | F. none                |
18. Identify the odd from the rest?
- |                     |                      |
|---------------------|----------------------|
| A. Electronic mouse | D. Voice recognition |
| B. Trackball        | E. Pointing stick    |
| C. Touch pad        | F. Touch screens     |
19. Information systems provide output in variety of forms. Which of the following is not the form output produced by information systems?
- |                           |            |
|---------------------------|------------|
| A. video outputs          | D. voice   |
| B. liquid crystal display | E. A and B |
| C. printed outputs        | F. None    |
20. Identify the odd storage device.
- A. Floppy disks
- B. Compact disk recordable
- C. Hard disks
- D. magnetic disks
- E. B and D
- F. None of the above

**Part two- Fill in blank spaces (1 pts each)**

1. ----- are computerized systems that perform and record daily routine transactions necessary to conduct business.
2. ----- is the ability to look at database from different perspective.
3. ----- are operating instructions for the people who use the information-----system
4. One terabyte represents ----- bytes.
5. ----- Printers spray ink onto a page one line at a time.

**Part three- Matching one (1 pts each)**

Match part one of the following with their correct match under “B”.

**Column A**

1. The use of groupware tools to support collaboration among network teams.
2. translates high level instructions in to machine language instruction
3. coaxial cable, microwave, fiber optics, satellite, radio waves
4. modems, multiplexers, switches, hub, routers
5. a device that converts digital signals to Analog and analog signals to digital

**Column B**

- A. Assembler
- B. Data dictionary
- C. compiler
- D. data modelling
- E. telecommunication processors
- F. information system end users
- G. channels
- H. telecommunication soft wares
- I. Information system specialists
- J. information
- K. modems
- L. data warehouse
- M. routers
- N. enterprise collaboration