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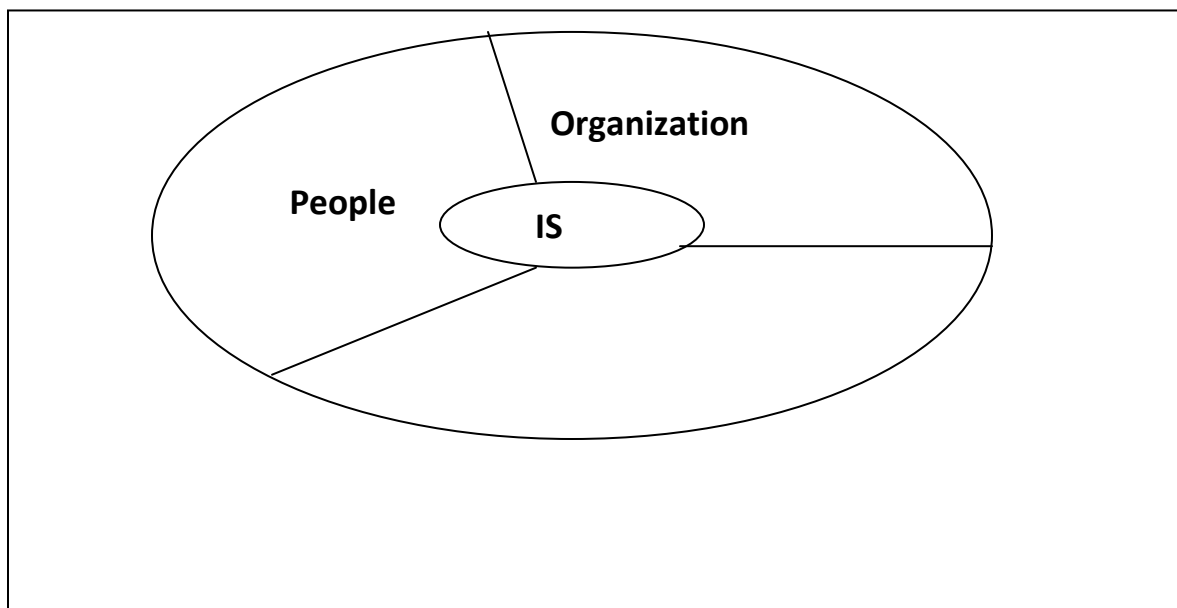
Principles of Information System

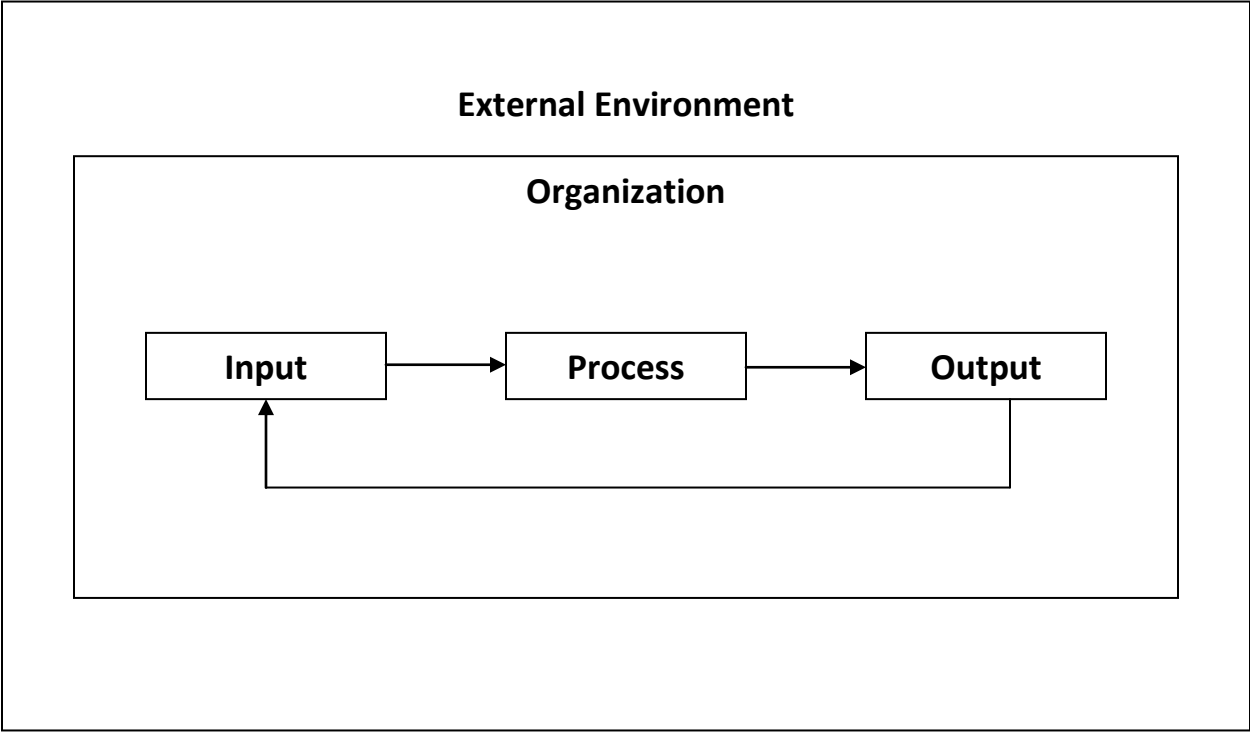
مبادئ نظم المعلومات

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Information systems Definition

I.S is a set of interrelated components work together to collect, retrieve, process, store and disseminate information for the purpose of facilitating planning , control , analysis ,coordination and decision making in business and other organizations .





Overview of information systems

There are many types of information systems in the real world. All of them use hardware, software, network, and people resources to transform data resource into information products. Some are

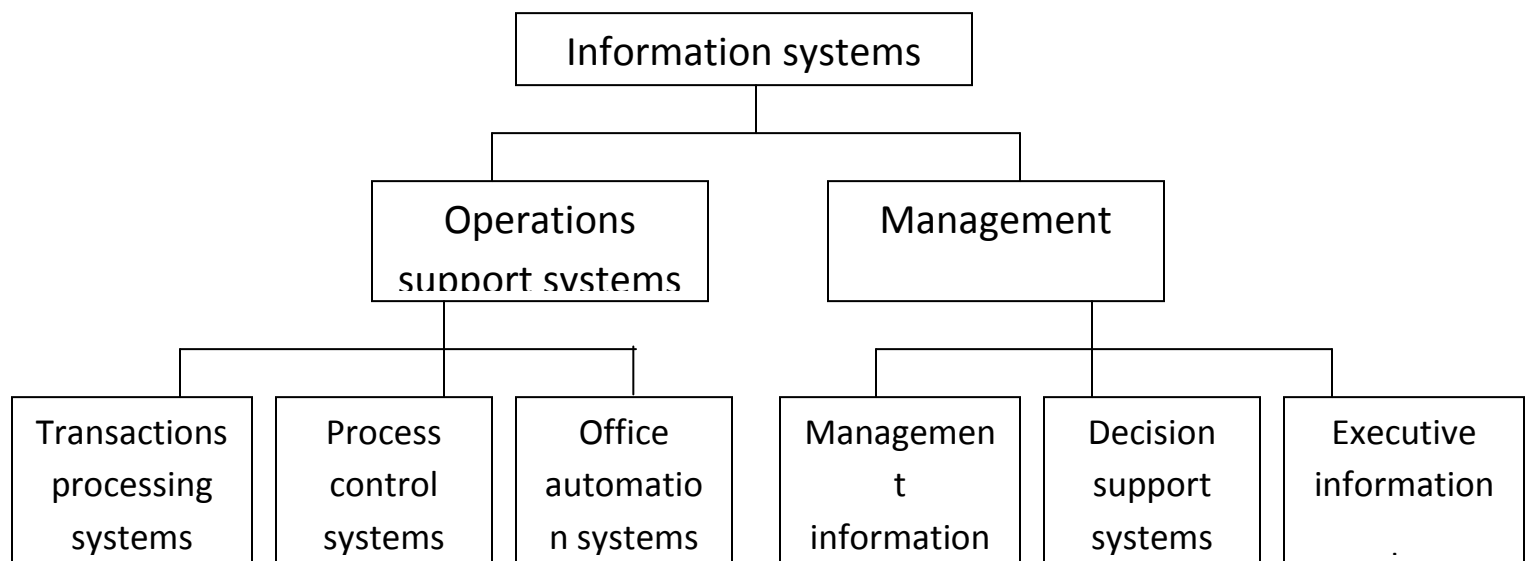
1) Manual information systems, where people use simple tools such as pencils and paper, or even machines such as calculators and typewriters.

2) Computer-based information systems that rely on a variety of computer systems to accomplish their information processing activities.

Types of information systems

Conceptually, information systems in the real world can be classified several different ways. For example, several types of

information systems can be classified as either ***operations or management*** information systems. Figure below illustrates this conceptual classification of information systems.



Operation and management classification of Information systems

1) Operations support systems

Information systems have always been needed to process data generated by and used in business operations. Such operations support systems produce a variety of information product for internal and external use. However they do not emphasize producing the specific information product that can best be used by manager. Further processing by management information systems is usually required. The role of a business firm's operations support systems is to efficiently process business transactions, control industrial process, support office communications and productivity, and update corporate databases.

a) Transactions processing systems are an important example of operations support systems that record and process data resulting from business transactions. They process transactions in two ways:-

- 1) Batch processing**, transactions data is accumulated over a period of time and processed periodically.
- 2) Real-time (or online)** processing, data is processed immediately after a transaction occurs.

b) Process control systems monitor and control physical process. For example, a petroleum refinery uses electronic sensors linked to computers to continually monitor chemical processes and make instant (real-time) adjustments that control the refinery process.

c) Office automation systems enhance office communications and productivity. For example, a corporation may use word processing for office correspondence, and electronic mail to send and receive electronic messages.

2) Management support systems

When information systems focus on providing information and support for effective decision making by managers, they are called management support systems. Providing information and support for decision making by all levels of management (from top executives to middle manager to supervisors) is a complex task. Conceptually, several major types of information systems support a variety of managerial end user responsibilities:-

a) Management information systems provide information in the form of reports and displays to manager. For example, sales managers may use their computer workstations to get instantaneous displays about the sales results of their products and to access weekly sales analysis reports that evaluate sales made by each salesperson.

b) Decision support systems give direct computer support to managers during the decision-making process.

c) Executive information systems provide critical information in easy to use displays to top and middle management. For example, top executives may use touch screen terminals to instantly view text and graphics displays that highlight key areas of organizational and competitive performance.

Difference between Management information systems(MIS) and Decision support systems(DSS)

	MIS	DSS
Decision support	Provide information about the performance of the organization.	Provide information and decision support technique to analyze specific problem.
Information processing methodology	Information produced by extraction and manipulation of business data.	Information produced by analytical model of business data.
Types of decision supported	Structured for operational and tactical planning and control.	Semistructured, unstructured for tactical strategic planning and control.
Types of decision maker	Prespecified, fixed format	Flexible, adaptable format

Information System Resources

Our basic IS model shows that an information system consists of five major resources:-

1) People Resources:-people are required for the operation of all information systems. These people resources include

a) End users (also called users or clients) are people who use an information system or the information it produces. They can be sales persons, engineers or managers.

b) IS specialists are people who develop and operate information systems. They include systems analysts, or programmers.

2) Hardware Resources :-the concept of hardware resources includes all physical devices and materials used in information processing Examples of hardware resources in computer based information system are

a) **Computer systems**, which consists of central processing units (CPUs) and a variety of interconnected peripheral devices. Examples are large mainframe computer systems and microcomputer systems.

b) **Computer peripherals**, which are devices such as a keyboard or electronic mouse for input of data and commands, a video screen or printer for output of information, and magnetic or optical disks for storage of data resource.

3) Software Resources

The concept of software resources includes all sets of information processing instructions. The following are examples of software resources:

a) **System software**, such as an operating system program , which controls and supports the operations of a computer system

b) **Application software**, which are programs that direct processing for a particular use of computers by end users. Example is a word processing program.

- c) **Procedures**, which are operating instructions for the people who will use an information system. Example is using a software package.

4) Data resources

The concept of data resources has been broadened by managers and information systems professionals. They realize that data constitutes a valuable organizational resource. Thus, you should view data resources that must be managed effectively to benefit all end users in an organization.

The data resources of information systems are typically organized into:

- a) **Databases** that hold processed and organized data.
- b) **Knowledge bases** that hold knowledge in a variety of forms such as facts and rules of inference about various subjects.

5) Network Resources

Telecommunication network have become essential to the successful operations of modern organizations and their computer based information systems. Telecommunication network consists of computers, end user terminals, communications processors and other devices interconnected by communications media and controlled by communications software. Net work resources include:-

- a) **Communication media:** examples include twisted-pair wire, coaxial cable, fiber optic cable, microwave systems, and communications satellite systems.
- b) **Network support:** this generic category includes all of the people, hardware, software, and data resources that directly support the operation and use of a communication network.

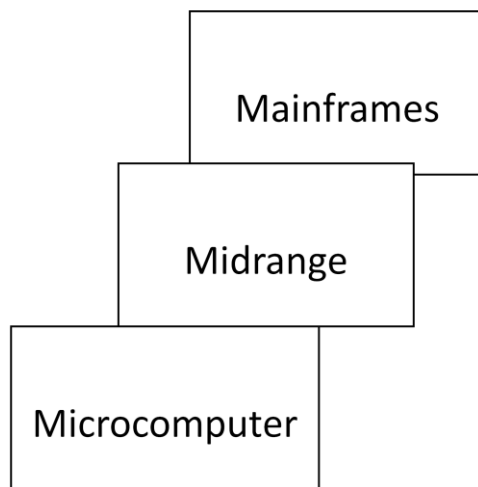
Information System Hardware

-Computer categories

Computer systems are typically classified as

- 1) Microcomputers
- 2) Midrange computers
- 3) Mainframe computers

Figure below illustrates computer classification



1) Microcomputer systems:-

Microcomputers are the smallest but most important category of computer systems for end users. Typically we refer to a

microcomputer as a personal computer or PC. However, microcomputer have become much more than small computers used by individual persons. Their computing power now exceeds that of mainframe at a fraction of their cost. For this reason, they have become powerful professional workstations for use by end users in business and other organizations.

Most microcomputers are single user computers designed to support the work activities of a variety of end users.

2) Midrange computers

Also called minicomputers are larger and more powerful than most microcomputers but are smaller and less powerful than most large mainframes computer systems. In addition, midrange systems cost less to buy and maintain than mainframe computers. They can function in ordinary operating environment and do not need special air conditioning.

Midrange computers are being used for many business and scientific applications such as

- a) They become popular as minicomputers for scientific research, instrumentation system, engineering analysis and industrial process monitoring and control.
- b) They become popular as powerful network servers to help manage large interconnected local area networks that tie together many end user microcomputer workstations and other computer devices in departments, offices and other work sites.

3) Mainframe computer systems

They are large, powerful computers that are physically larger than micros and minis and usually have one or more central processors with faster instruction processing speeds. For example, they typically process hundreds of million instruction per second (MIPS). They have large primary storage capacities. Many mainframes models have the ability to service hundreds of users at once, For example, a single large mainframe can process hundreds of different programs and handle hundreds of different peripheral devices (disk, printers) of hundreds of different users at the same time.

-Central processing unit (CPU)

The CPU is the most important hardware component of a computer system. It is also known as the central processor or instruction processor, and the main microprocessor in a microcomputer. Conceptually, the CPU can be subdividing in to two major subunits: the arithmetic logic unit and the control unit. The CPU also includes specialized circuitry and devices such as registers for high speed.

- 1) The control unit (CU)** obtains instruction from those stored in the primary storage unit and interprets them .Then it transmits directions to the other components of the computer system, ordering them to perform required operation.

- 2) The Arithmetic logic unit (ALU)** performs required arithmetic and comparison operations. A computer can make logical changes from one set of program instruction to another based on the results of comparisons made in the ALU during processing.

Multiple processors

Many current computers use multiple processors for their processing functions. Instead of having one CPU with single control unit and arithmetic logic unit, the CPUs of these computers contain several types of processing unit as illustrated:-

1) A support processor design relies on specialized microprocessors to help the main CPU perform a variety of functions. These microprocessors may be used for input/output, memory management and arithmetic computations, thus freeing the main processor to do the primary job of executing program instructions.

2) A coupled processor design uses multiple CPUs or main microprocessors to do multiprocessing, that is, executing more than one instruction at the same time. Some configurations provide a fault tolerant capability in which multiple CPUs provide a built in back up to each other should one of them fail.

3) A parallel processor design uses a group of instruction processors to execute several program instructions at the same time. Sometimes, hardware or thousands of processors are organized in clusters or network in Massively Parallel Processor (MPP) computers. Other parallel processor designs are based on simple models of the human brain called neural networks. All of these systems can execute many instructions at a time in parallel.

Data 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.

Multiprocessing

The mode in which a computer uses more than one processing unit simultaneously to process data.

Memory characteristic and functions

No step in the machine cycle can be taken without a place for the CPU to store the instructions and data needed for a particular process. Primary memory is that place. Because primary memory must exist in a computer for the CPU to do its job, many consider it to be another part of the CPU.

External storage consists of media that allow permanent storage of programs and data. Such media include magnetic disks, magnetic tapes, and optical disks.

Primary memory is used in the actual processing of data inside the computer all data and instructions must be copied to RAM for the CPU to execute them two types of storage space compose a computer's primary memory:-

1) 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. So, for a program to run, all instructions and data first must be entered into RAM, either from a keyboard or other input device, or from an external storage device , such as a magnetic disk or CD.

Every RAM location has a unique address called a memory address; that is how the CPU finds instructions and data. As soon as an instruction is copied into RAM, it is placed in a location with its memory address where it stays until other instructions or data replace it. Replacement occurs if the program sends another instruction to that address, or if the computer finishes executing an entire program and loads another.

2) Cache Memory virtually all new microcomputer models offer cache memory as a part of RAM. Cache memory is made up of fast memory semiconductor chips. The CPU can access cache memory faster than the rest of RAM. Cache memory stores the most frequently used instructions of the programs the computer runs, allowing faster retrieval and execution.

3) Read Only Memory A small part of primary memory consists of chips called read-only memory or (ROM). These chips hold instructions that let you communicate with the computer until operating system program, such as windows take control .ROM also holds ASCII codes for a character set: the 26 capital and lowercase letters, the digits 0 through 9, punctuation marks and other symbols such as \$ and.

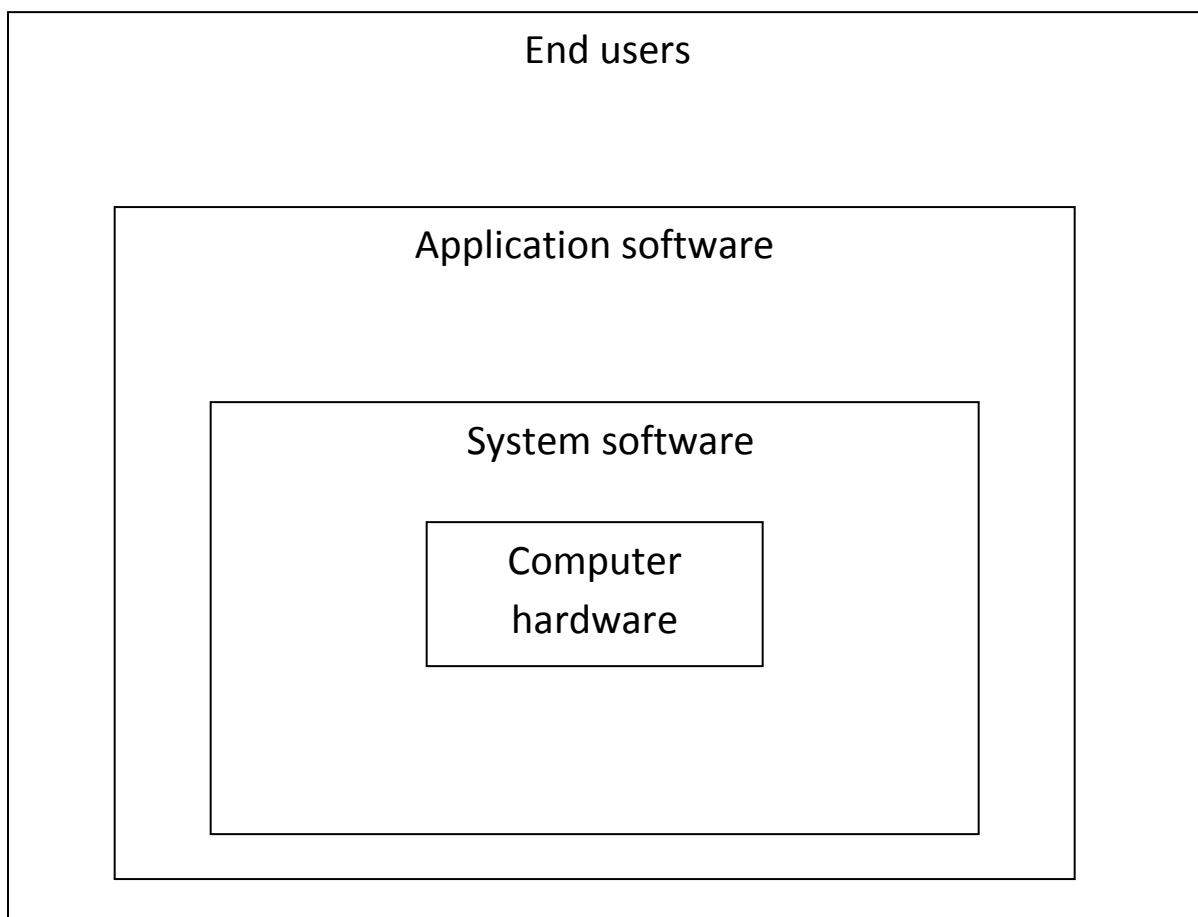
Information System Software

System software consists of programs that manage and support a computer system and its information processing activities. These programs serve as a vital software interface between computer system hardware and the application programs of end users. See figure bellow. We can group such programs into three major functional categories:-

- 1) **System management programs**:-programs that manage the hardware, software, and data resources of the computer system during its execution of the various information process jobs of users. The most important system management programs are operating systems and operating environments.

- 2) **System support programs**:-programs that support the operation and management of a computer system by providing a variety of support services. Major support programs are system utilities, performance monitors, and security monitors.

- 3) System development programs:-**programs that help users develop information system programs and procedures and prepare user programs for computer processing .major development programs are language translators and programming tools.



The system and application software interface between end users and computer hardware

Operating system

The most important system software packages for any computer is its operating system. An operating system is an integrated system of programs that manages the operational of the CPU, control the input/output and storage resources and activities of the computer system, and provides various support services as the computer executes the application programs of users.

Operating system functions

An operating system performs five basic functions in the operation of a computer system as

1) User interface

The user interface is the part of the operating system that allows you to communicate with it so you can load programs, access files, and accomplish other tasks. The trend is toward in easy to use graphical user interface (GUI) that uses icons, bars, buttons, boxes, and other images .GUI rely on pointing devices like

the electronic mouse to make selections that help you get things done.

2) Resource management

An operating system uses a variety of resources management programs to manage the hardware resources of a computer system, including its CPU, memory, secondary storage devices, and input/output peripherals. For example, memory management programs keep track of where data and programs are stored. They may also subdivide memory in to a number of sections and swap parts of programs and data between memory and magnetic disks or other secondary storage devices.

3) File management

An operating system contains file management programs that control the creation, deletion, and access of files of data and programs. File management also involves keeping track of the physical location of files on magnetic disks and other secondary storage devices.

4) Task management

The task management programs of an operating system manage the accomplishment of the computing tasks of end users. They give each task a slice of a CPU's time and interrupt the CPU operation to substitute other tasks.

5) System support programs

System support programs are a category of software that performs routine support functions for the users of a computer system. Utility programs, or utilities, are an important example. The programs perform miscellaneous housekeeping and file conversion functions. For example, sort programs are important utility programs that perform the sorting operations on data required in many information processing applications. Utility programs also clear primary storage, load programs, record the contents of primary storage, and convert files of data from one storage medium to another.

Other system support programs include performance monitor and security monitors.

Performance monitors are programs that monitor the performance and usage of computer systems to help its efficient use.

Security monitors are packages that monitor and control the use of computer systems and provide warning messages and record evidence of unauthorized use of computer resources.

Applications software

Application software consists of programs that direct computers to perform specific information processing activities for end users. These programs are called application packages because they direct the processing required for a particular use, or application, that end users want accomplished. Application software can be classified as:-

1) General purpose programs

General purpose application programs are programs that perform common information processing jobs for end users and GPP can divide into

- a) **Word processing packages** are programs that computerize the creation, editing, and printing of documents (such as letters, and reports) by electronically processing text data (words, phrases, sentences, and paragraphs).
- b) **Database management packages** such as access by Microsoft allow end users to setup databases of files and records on their personal computer systems and quickly store data

and retrieve information .Most DBMS packages can perform four primary tasks

- c) **Graphics packages.** Convert numeric data into graphics displays such as line charts and bar graph. Many other types of presentation graphics displays are possible .Draw and paint graphics packages support freehand drawing.

2) Application specific programs

Thousands of application software package are available to support specific applications of end users. Major categories of such application specific programs are:-

- a) **Business application programs.** Programs that accomplish the information processing tasks of important business functions or industry requirements.
- b) **Scientific application programs.** Programs that perform information processing tasks for the natural, physical, and behavioral sciences, and for mathematics, engineering, and all other areas involved in scientific research, scientific analysis, engineering design, and monitoring of experiments.

- c) **Other application programs.** There are so many other application areas of computers that we lump them all into this category. Thus, we can talk of computer applications in education, music, art ,law, medicine, and so on.

Programming languages

A programming language allows a programmer or end user to develop the sets of instruction that constitute a computer program. Many different programming languages have been developed, each with its own unique vocabulary, grammar, and users. Programming languages can be grouped into the five categories as:-

1) Machine languages (or first generation languages) are the most basic level of programming languages. In the early stages of computer development, all program instructions had to be written using binary codes unique to each computer. This type of programming involves the difficult task of writing instruction in the form of strings of binary digits (ones and zeros) or other number systems. Programmers must have a detailed knowledge of the internal operations of the specific type of CPU they are using .They must write long series of detailed instructions to accomplish even simple processing tasks.

2) Assembler languages (or second generation languages) are the next level of programming languages. They were developed to reduce the difficulties in writing machine language programs. The use of assembler language requires language translator program called assembler that allows a computer to convert the instructions of such languages into machine instructions. Assembler languages are frequently called symbolic languages because symbols are used to represent operation codes and storage locations

3) High level language (or third generation languages) uses instructions, which are called statements, that closely resemble language or standard notation of mathematics. Individual high level language statement are actually macroinstructions, that is ,each individual statement generates several machine instructions when translated into machine language by high level language translator.

4) Forth generation languages most forth generation languages are non procedural languages that encourage users and programmers to specify the result they want, while the computer determines the sequence if instructions that will accomplish those result. Users and programmers no longer have to spend a lot of time developing the sequence of instructions the computer must follow to achieve a result. Thus, 4GLs have helped simplify the programming process. Natural

languages are 4GLs that are very close to English or other human languages.

Example

Machine language

High level language

1010 11001

Basic

1011 11010

Z=5 , Y=3

1100 11011

X=Y+Z

Assembler languages

Forth generation languages

LOD Y

Sum the following numbers

ADD Z

Z AND Y

STR X

put the result in X

5) Object oriented languages

Object-oriented programming languages are among the newest types of programming languages. Instead of separating variables, procedures, and data, as in traditional programming languages, object-oriented programs group all pieces together into “objects.” An example of an object might be employee identification and payroll information and a

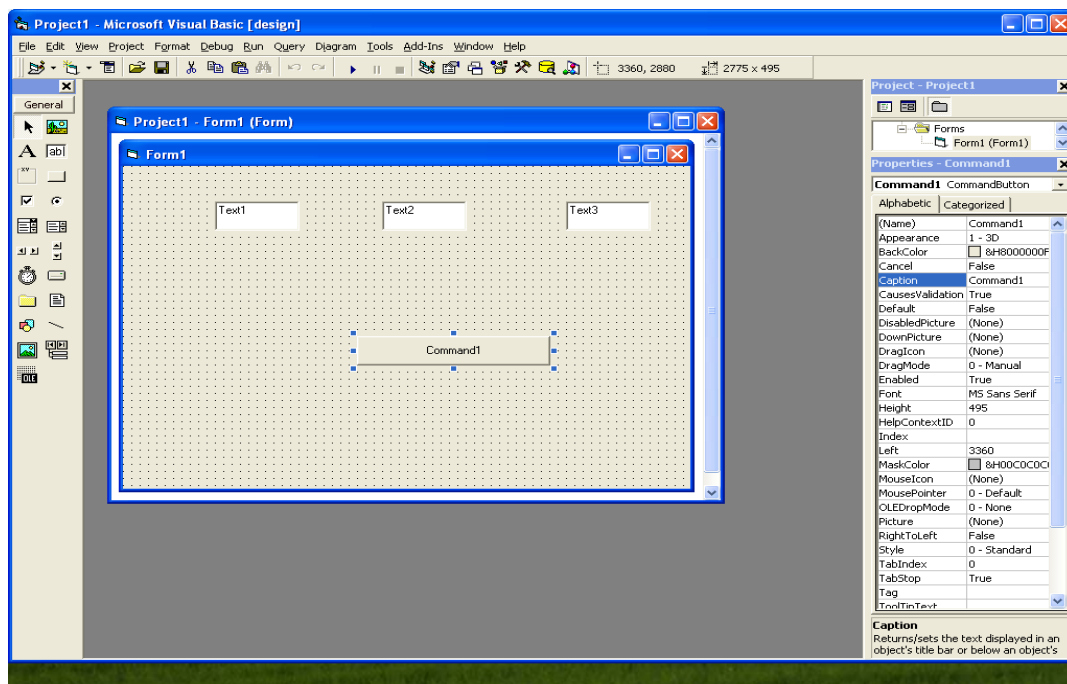
set of corresponding rules for calculating monthly payroll for a variety of job classifications and tax rules. This process of grouping the data and instructions together into a single object is called ***encapsulation***. By encapsulating the instructions and data together, programs are easier to maintain because the things that are grouped together are protected or isolated from other parts of the program.

A second characteristic of object-oriented languages is ***inheritance***, which means that all lower-level, or children, nodes in an inheritance hierarchy inherit the characteristics of the parent node. In addition to being object-oriented, programs and programming languages can also be ***event-driven***. Unlike programs written in procedural programming languages, programs written with the event-driven approach do not follow a sequential logic. The programmer does not determine the sequence of execution for the program. The user can press certain keys and click on various buttons and boxes presented to her.

6) Visual Programming Languages

Visual programming languages make programming easier and more intuitive. They allow the programmer to create the graphics-intensive applications that today's business user's demand. For example, to make a button appear for the user on a particular screen at a particular point

in time, a programmer using a visual programming language only needs to bring up the screen where the button is to appear, choose the button from a palette of choices, drag and drop the button to the proper location, size and style the button with a few mouse clicks, and click on the button's pop-up menu to set the properties that will control its behavior (see Figure below



Programming languages translator (PLT)

PLT are programs that translate other programs into machine language instruction codes that computers can execute and can be divided into the following:-

- 1) **An assembler** translates the symbolic instructions codes of program written in an assembler language into machine language instructions.
- 2) **A compiler** program that translate a high level programming language into machine language program.
- 3) **An interpreter** program that translates and executes each source language statement before translating and executing the next one.

Data management module

Data management module is a database that allows a decision maker to conduct the intelligence phase of decision making .For example, an investment consultant always need access to current stock prices and those from at least the preceding few year. A data management module accesses the data and provides a mean for decision system to select data according to certain criteria: type of stock, range of years, and so on.

Traditional approach for data management

A data file is a collection of logically related records. Therefore, in a file management environment, each application has a specific data file related to it, containing all data records needed by the application. Over time, organizations developed numerous applications, each with associated, application specific data file. For example, a university has many computer based applications involving students. These applications include course registration, fee payment, and grades among others. In a file management environment, each of these applications would have its own student data file. This approach to data management, where the

organization has multiple applications with related data files, is considered the traditional approach.

Problems with traditional file approach

The traditional file approach led to many problems:-

1) Corporate applications typically share some common core functions, such as input, report generation, querying, and data browsing. However, these common functions typically were designed, coded, documented, and tested, at great expense, for each application.

2) Data redundancy: As applications and their data files were created by different programmers over a period of time, the same piece of information could be duplicated in several places. In the university example, each data file will contain records about students, many of whom will be represented in other data files. Therefore, student file in the aggregate will contain some amount of duplicate data.

3) Data inconsistency: Data inconsistency means that the various copies of the data no longer agree. For example, if a student changes

his or her address, the new address must be changed across all applications in the university that require the address.

4) Data isolation: With applications uniquely designed and implemented, data files are likely to be organized differently, stored in different formats and often physically inaccessible to other applications. In the university example, an administrator who wanted to know which students taking advanced courses were also starting players on the football team would most likely not be able to get the answer from the computer based file system.

5) Security: security is difficult to enforce in the file environment, because new applications may be added to the system.

6) Data integrity: Data values must often meet integrity constraints that are; they must be accurate and fit for their intended use. For example, the students Social Security data field should contain no alphabetic characters, and the students' grade point average field should not be negative. It is difficult to place data integrity constraints across multiple data files.

7) Data independence: In the file environment, the applications and their data files are dependent on each other. Storing data in files that were tightly linked to their applications eventually led to organizations having hundreds of applications and data files, with

no one knowing what the applications did or what data they required.

Database approach for data management

A database, which is a logical group of related files, can eliminate many of the problems associated with a traditional file environment. With the database approach, all the data are typically contained in the same storage location, rather than residing in many different files across the organization. Unlike the traditional approach, in which different programs access the different data files, the database is arranged so that one set of software programs the database management system provides access to all the data. Therefore, data redundancy, data isolation, and data inconsistency are minimized, and data can be shared among all users of the data. In addition, security and data integrity are increased, and applications and data are independent of one another.

Database definition

A database is a collection of several related files, the program used to build database, populate them with data, and manipulate the data.

Database approach versus traditional file approach

If you wanted to access data from files that were stored in a traditional file approach, the records would have to be organized in a very specific way, and you would have to know exactly how many characters were designed for each type of data.

If you are using a database, you want to be able to move rapidly from one record to another, sort by different criteria, create different types of reports, and analyze the data in different ways.

Database advantages

Database systems provide many advantages to the organization:

- 1) Improved strategic use of corporate data
- 2) Reduced complexity of the organization's information systems environment
- 3) Reduced data redundancy and inconsistency
- 4) Enhanced data integrity
- 5) Application data independence

- 6) Improved security
- 7) Reduced application development and maintenance costs
- 8) Improved flexibility of information systems
- 9) Increased access and availability of data and information

Logical and Physical organization of data

The physical organization deals with the actual, physical arrangement and location of data in direct access storage devices (DASD). Database specialists use the physical organization to make efficient use of storage and processing resources. Users, however, may wish to see differently from how they are stored, and they do not know all the technical details of physical storage.

The logical organization a database represents data in a format that is meaningful to a user and to the software programs that process that data. That is, the logical organization tells the user what is in the database.

Keys and attributes

To retrieve records from a database, or to sort them, you must use a key. A key is a field whose values identify records either for display or for processing. You may use any field as a key. For example, you could ask the database for record of pupil Ali from the student table by using the L.Nme field as a key. That is, you enter a query, a condition that instructs the database to retrieve a record with the value of L.Name as “Ali”. A key is unique if the value (content) in that field appears only in one record. Sometimes a key is composed of several fields so that their combination provides a unique key.

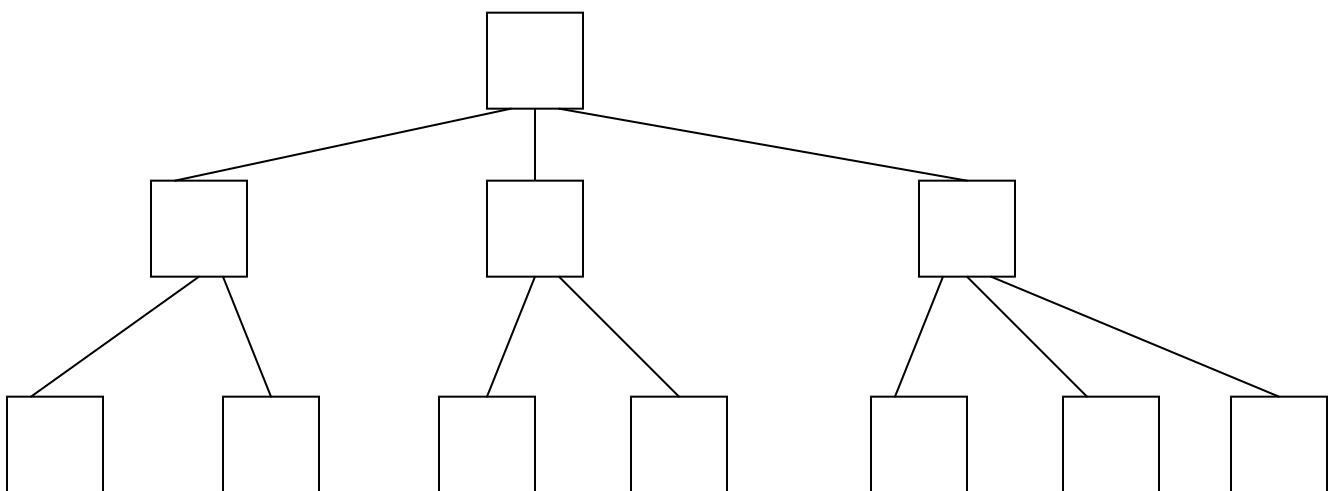
Figure 1 Attributes of Student object
Stud ID
Stud Last Name
Stud First Name
Stud Dept
Stud Office Address
Stud Telephone

Data structure of database

A database model is the general logical structure in which records are stored within a database and the method used to establish relationships among the records. There are several database structures:-

1) Hierarchical data structure

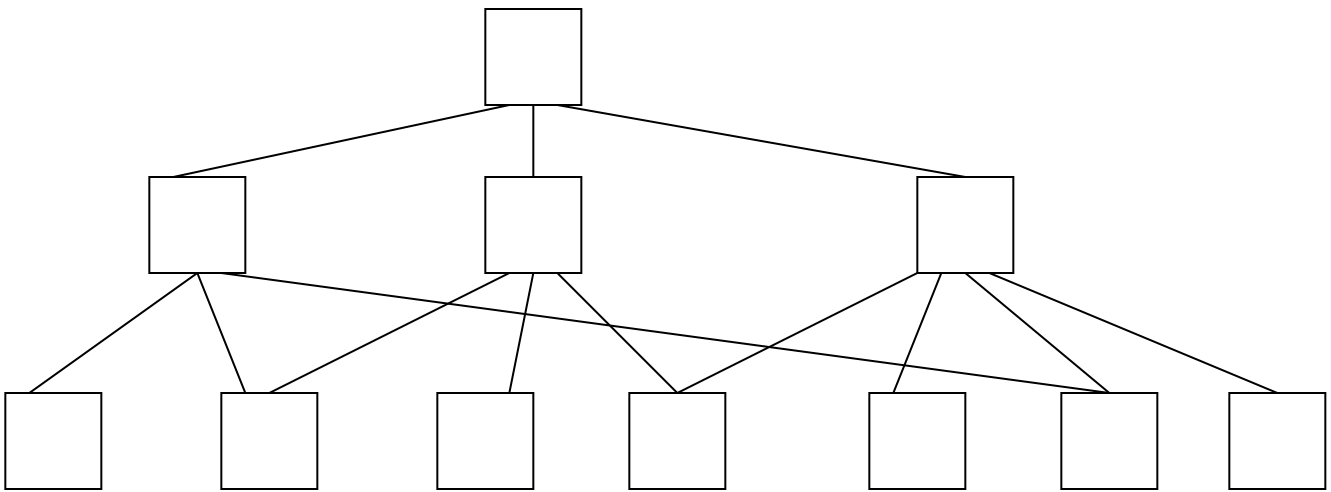
To understand the various models, consider a database for storing university data: there are records about colleges, departments, proffers, and students. Logically, these four types of university records are hierarchical, meaning that each category is a subcategory of the next level. The highest level is college; each college has several departments; each department consists of several professors; and each professor has several students. The hierarchical structure follows the pattern of upside-down tree and is sometimes referred to as the tree model. Therefore, if the university chose to follow a hierarchical model, the records would be stored as indicated in figure bellow.



The advantage of hierarchical database is their suitability for maintaining data on hierarchical environments. But hierarchical databases also have several disadvantages. To retrieve a certain record, users must start the search at the root, which is the set of records at the very top level, and then navigate the hierarchy until they find the desired record. If for some reason, a link is broken, the entire branch that was connected through that pointer to the other records is lost. And because child records can have only one parent, hierarchical database require considerable data redundancy.

2) Network data structure

The reverse of the last disadvantage of the hierarchical structure is the greatest advantage of the network structure: the ability to store a record only once in the entire database while creating links that establish relationships with several records of another type of entity. Remember that in the hierarchical structure there was data redundancy because separate repetitive records for student had to be maintained in two different student files. The network structure on the other hand, would allow the same record to be linked to more than one parent as illustrated in figure below



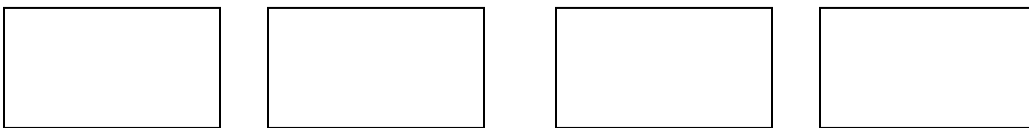
Network database create significantly less data redundancy than hierarchical databases, but they are complicated to build and difficult to maintain. While the user does not have to start a search at the root, it is difficult to navigate in the database. The complex network of relationships creates a “**spaghetti**” that is hard to follow. For this reasons, the network structure is least popular mode.

3) Relational structure

A relational model database has all the advantages of a network database without the complications. The relational model consists of

table. Its roots are in relational algebra, although you do not have to know relational algebra to build and use relational databases. In relational database, a record is called a ***tuple***, a column of fields is called an attribute, and a table is called a relation. Relational databases are easier to conceptualize and maintain than hierarchical and network models. To build a relational database, you only need to have a clear idea of the different entities and how they relate. In our example, the entities are college, department, professor, and student. A single table is built for each object. Remember that entity in our context refers to a record structure of all the occurrence of a subject. Thus, when database designers think of “professor,” they know the professor table may include records of many professors.

Retrieving a desired record is easy. To find a record of a certain professor, you need to access the professor table and make an inquiry. Maintenance is easy because the user does not have to recall any relationships. Each table stands alone. To add a student record, the user accesses the student table. Similar actions take place to change or delete a record figure bellow illustrated.



A manager's view of telecommunications networks

Why telecommunications is important?

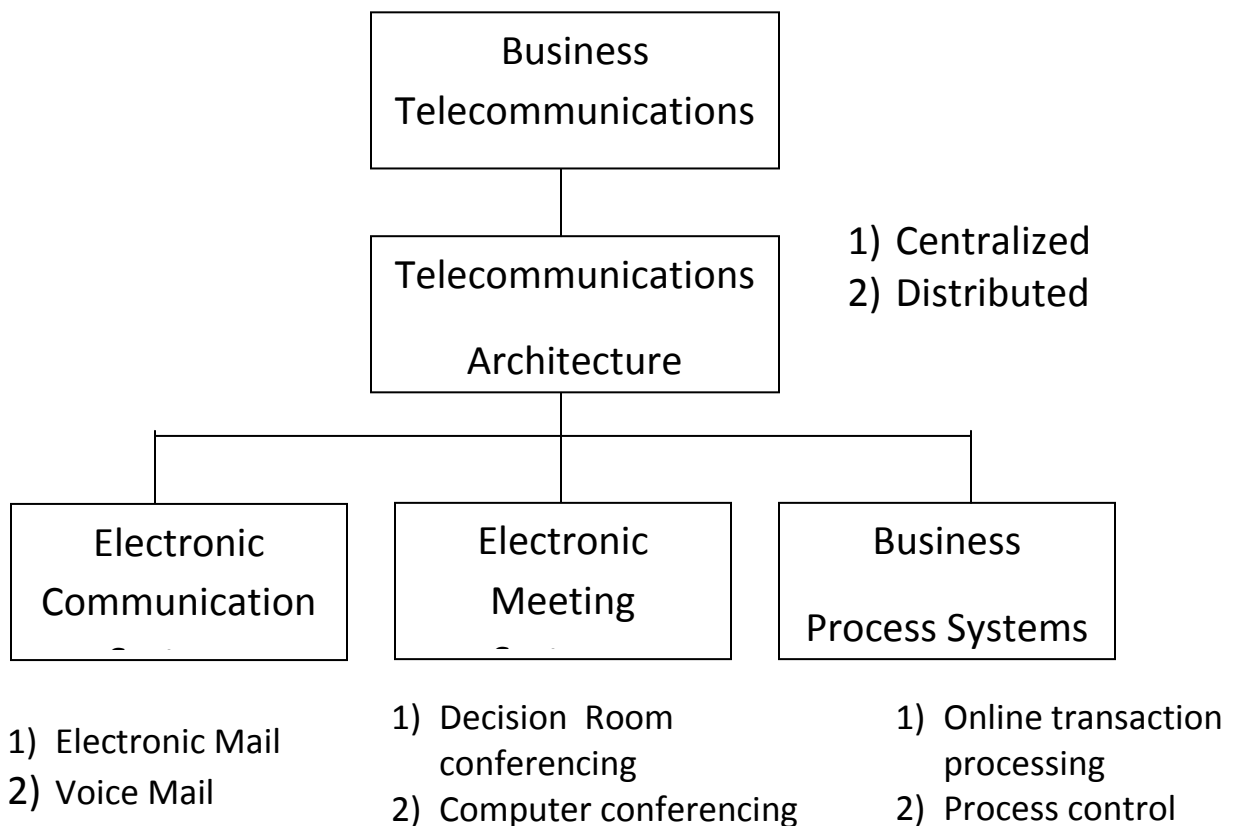
End users need to communicate electronically to succeed in today's global information society.

Telecommunications is the sending of information in any form (e.g., voice, data, text, and images) from one place to another using electronic or light emitting media.

Application of telecommunications

Telecommunications networks provide valuable capabilities to an organization and its end users. For example, some networks enable work groups to communicate electronically and share hardware, software, and data resources. Other networks let a company process sales transaction immediately from many remote locations, exchange business documents electronically with its customers and suppliers, or remotely monitor and control production processes. Telecommunications networks can also interconnect the computer

system of business so their computing power can be shared by end users throughout an enterprise. And, of course, telecommunications networks enhance collaboration and communications among individuals both inside and outside an organization. Figure bellow shows the application of telecommunications.



Tools for telecommunication

Tools for telecommunication are:-

1) Telephone related communication services

Telephone is the process that occurs when two people who wish to contact each other by telephone repeatedly miss each other phone calls. Telephone can be divided in to four types

a) Fax messages

Dedicated fax machine are specialized devices that do nothing except send and receive copies of document over transmission lines to and from other fax machines.

b) Fax modems

Which is installed as circuit board inside a computer's system cabinet, is a modem with fax capability? It enables you to send and receive signals directly between your computer and some one else fax machine or fax modem.

c) Voice mail

A variation of electronic mail where digitized voice messages rather than electronic text are accepted, stored, and transmitted.

d) Electronic mail

Electronic mail like computers by wired or wireless connection and allows users, through their keyboard to post and read responses on their display screen.

2) Video/Voice communication

Video/Voice communication can be divided into

a) Video conferencing also called teleconferencing is the use of television video and sound technology as well as computers to enable people in different locations to see, hear, and talk with one another.

b) Picture phone: - this device is a telephone with a TV like screen and built in a camera.

Basic telecommunication signals

Communication is any transfer of data within a computer, between a computer and another device, or between two computers.

Modems

(Modulator –Demodulator) a device that converts the digital signals from input/output devices into appropriate frequencies at a transmission terminal and convert them back into digital signals at a receiving terminal.

Data transmission

Data can be transmitted in two basic modes: a whole byte at a time, which is feasible only over very short distances, or a single bit at a time, currently the only practical mode for communicating over long distances. Within the computer and between the computer and its peripheral equipment (such as its printer and external hard disk).

Direction of data transmission

The transmission can take the form of:-

1) Parallel transmission, each byte is transmitted in its entirety. The electrical impulses representing the bits of a byte are transmitted along a bundle of parallel lines, one bit through each line. These lines are often called bus.

2) Serial transmission, on the other hand, data is transmitted one bit at a time through a single line.

Parallel and serial data transmission require different types of wiring .In the back of a computer are several outlets or ports for ports for connecting different cables. An outlet that can accepts a parallel device cable is a parallel port. An outlet that can accepts a serial device cable is a serial port.

Parallel and serial transmission characters 9 and D

D 9

=====

1	1
---	---

=====

1	1
---	---

=====

0	1
---	---

=====

0	1
---	---

=====

0	1
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=====

1	0
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0	0
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=====

0	1
---	---

D 9

=====

00100011

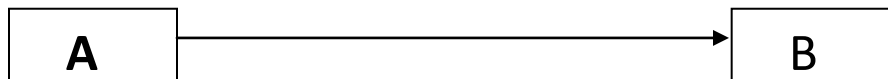
10011111

Communication channels

The three modes of communication between devices:-

1) 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.



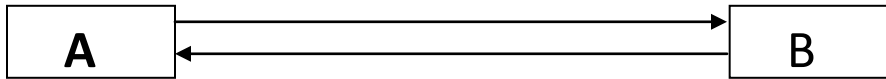
Only transmits

Only receives

2) 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 at the same time, and one device can transmit to other only when the other device is in reception mode.

Half duplex may take place when you use a computer terminal to communicate with a mainframe computer.

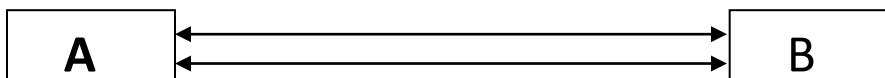


Transmits when B receives

Transmits when A receives

3) Full-duplex

In full duplex communication, either device can transmit to the other device while simultaneously receiving signals from the other device. This 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. Full duplex data communication is often used between computers.



Transmits and receives while

Transmits and receives while

B transmits and receives

A transmits and receives

Bandwidth

A communication 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 (Note that the numbers are approximate .They are actually power of 2.Thus 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 transmission.

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)

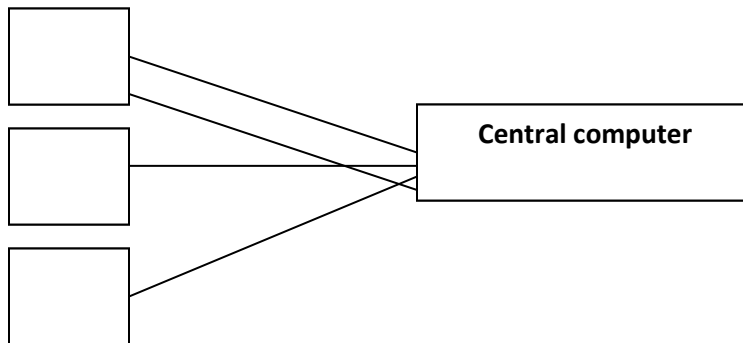
Telecommunication Network topologies

There are several basic types of network topologies, or structure, in telecommunications networks as:-

1) point to point lines

When point to point lines are used, each terminal is connected by its own line to a computer system.

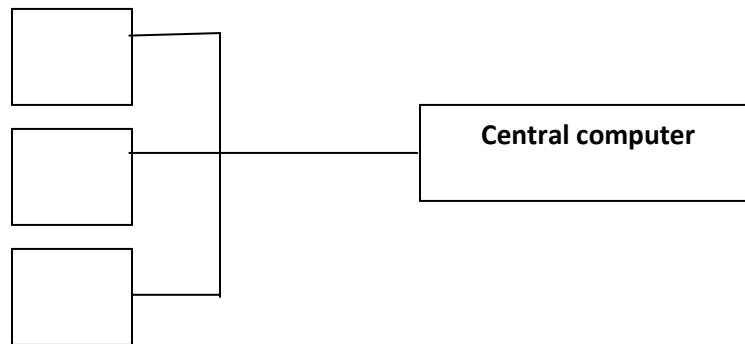
Terminals



2) Multidrop lines

When multidrop lines are used, several terminals share each data communications line to a computer.

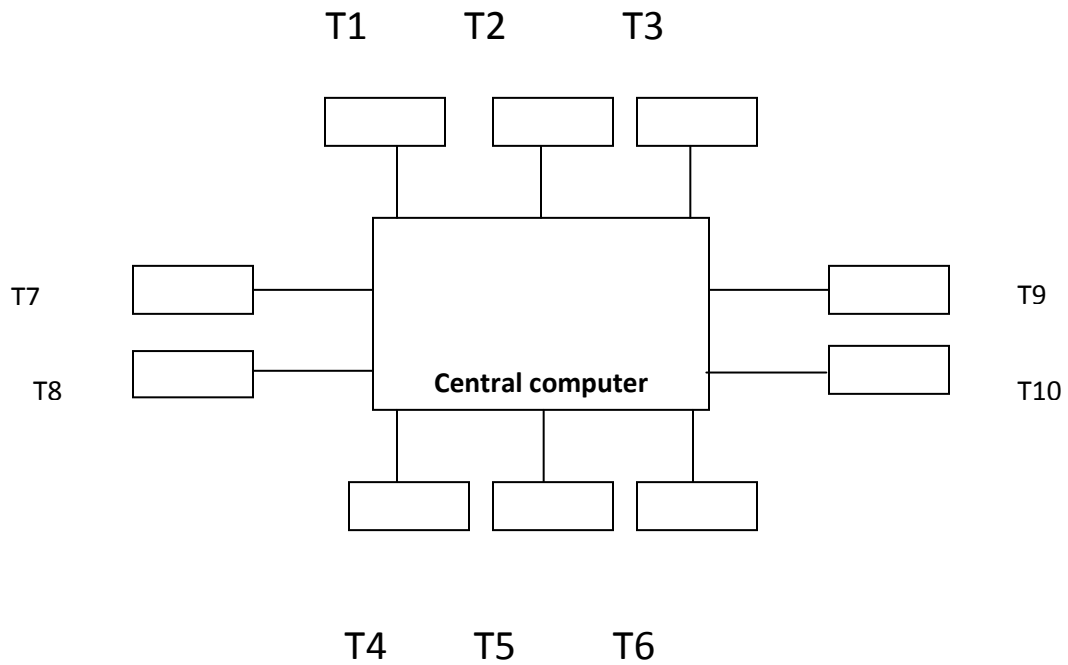
Terminals



Obviously point to point lines are more expensive than multidrop lines, all of the communications capacity and equipment of a communications line is being used by single terminal. Therefore, point to point lines are used only if there will be continuous communications between a computer and terminal or other computer system. A multidrop line decrease communications costs, because each line is shared by many terminals. Communications processors such as multiplexers help many terminals share the same line.

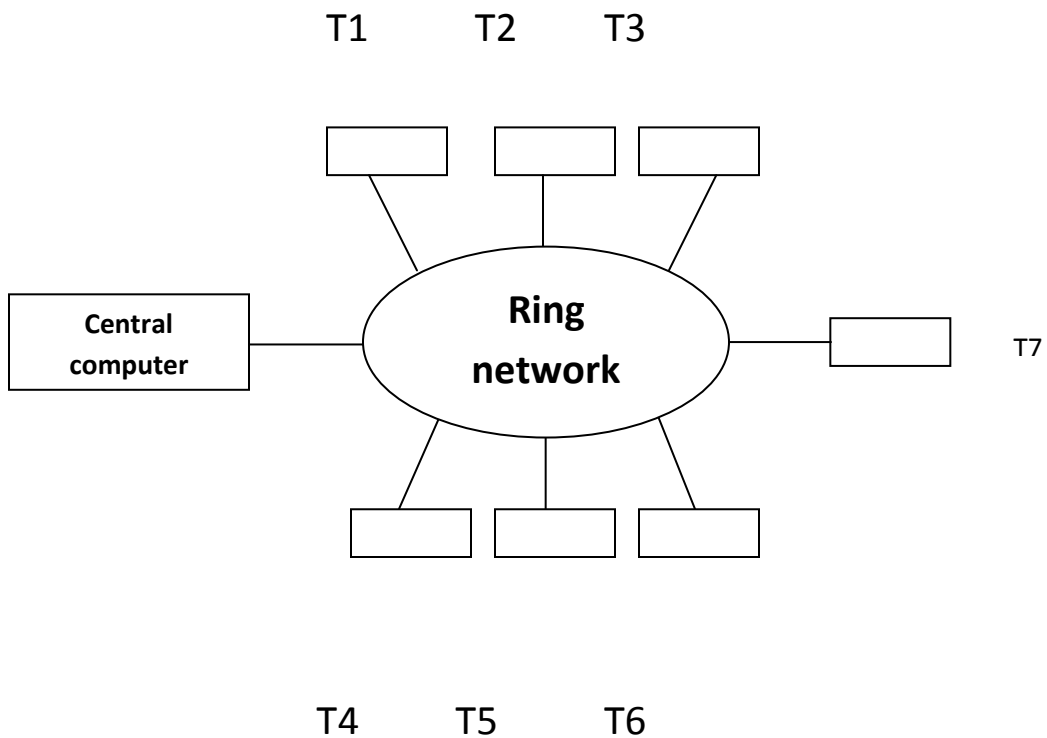
3) star network

A star network ties end user computers to a central computer.



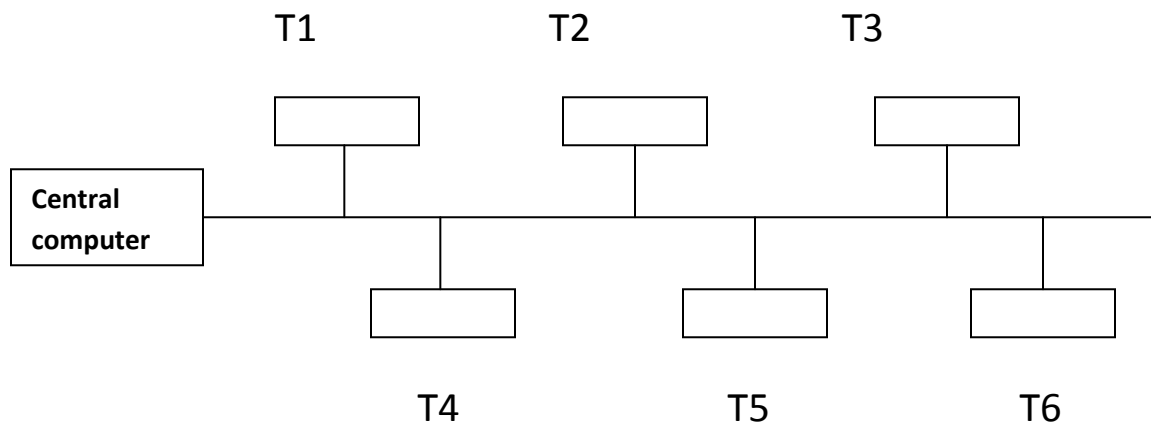
4) ring network

A ring network ties local computer processors together in a ring on more equal basis.



5) bus network

A bus network is a network in which local processors share the same bus, or communications channel. In many cases, star network take the form of hierarchical networks.



Internet

The internet is the largest network of networks today, and the closest model we have to the information superhighway of tomorrow. The internet (the Net) is rapidly growing global web of thousands of business, educational and research networks connecting millions of computers and their users in more than 100 countries to each other.

The most popular internet applications are E-mail and browsing the sites on the World Wide Web. Internet E-mail is fast, faster than many public networks. Messages usually arrive in seconds or a few minutes, anywhere in the world. And internet E-mail messages can also take the form of data, text, and video files.

The internet also support bulletin board systems formed by thousands of special internet groups. Any one can post messages on thousands of topics for interested users to read .Other popular applications include accessing files and databases from libraries and thousands of organizations, logging on to other computers in the network, and holding real time conversations with other internet users.

Important telecommunications services on the Internet

There are many services on the internet such as :-

- 1) E-mail:-**exchange electronic mail with millions of internet users.
- 2) Usenet:-**post messages on bulletin board systems formed by thousands of special interest discussion groups.
- 3) Internet Relay Chat:-**hold real time conversations with internet users around the world on hundred discussion channels.
- 4) File Transfer Protocol (FTP):-** download data files, programs, reports, articles, magazines, books, pictures, sounds, and other types of files from thousands of sources to your computer system.
- 5) Telenet:-**logon to and use thousands of internet computer systems around the world.

- 6) **World Wide Web (WWW)**:-point and click your way to thousands of hyperlinked internet sites and resources using graphical browser software.

Packet switching Technology

The internet relies on **Packet switching Technology** to deliver data and information across networks.. Packet switching enables million of users to send large and small chunks of data across the internet concurrently. To minimize delays network technologies limit the amount of data that a computer can transfer on each turn

Connecting Independent Networks

We can exam how packet-switching networks are interconnected to form the Internet. The Internet uses special-purpose computers, called routers, to interconnect independent net .For example, Figure 1 illustrates a router that connects Network 1 and Network2 router is like a conventional computer in that it has a central processor, memory, network interfaces routers do not use conventional software nor are they used to run applications Their only job is to interconnect networks and forward data packets from one network to another. For example, in Figure 1, computers A and F connected to independent networks. If

computer A generates a data packet destined for computer F, the packet is sent to the router that interconnects the two networks. The router forwards the packet onto Network 2 where it is delivered to its destination computer F.

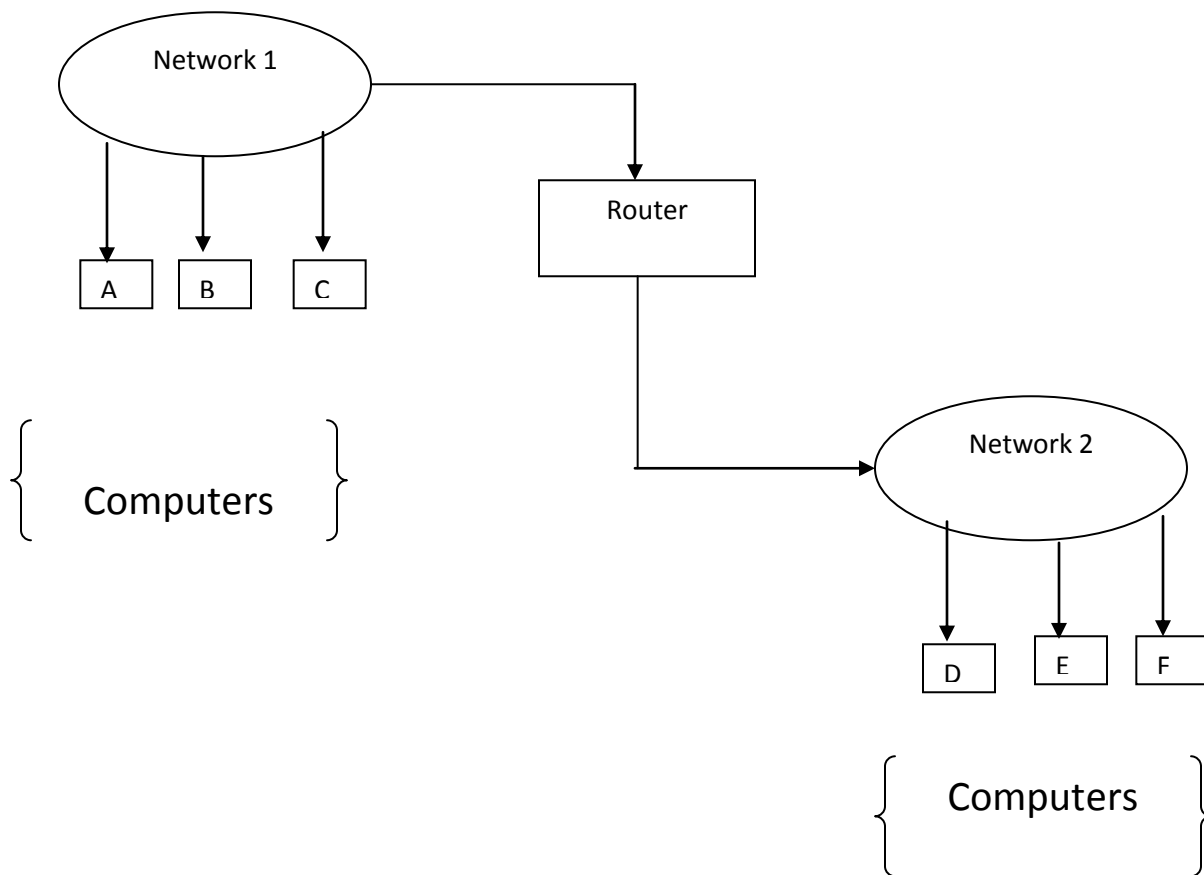


Figure1: computers A and F connected to independent networks.

Electronic Commerce

Electronic Commerce (EC) is the online exchange of goods, services, and money within firms, between firms, and between firms and their customers. The allure of EC is that it has no geographical or time limitations; with the help of technology firms can sell 7 days a week, 24 hours a day, 365 days a year to literally anyone, anywhere. In addition, parking for customers is no problem and firms can deliver the goods right to the customer's door.

The Many Faces of Electronic Commerce

EC now takes place in a number of different ways and on a number of different technology platforms. For example, Electronic Data Interchange (EDI), the on-line sale of goods and services between firms, has been happening for over a decade on proprietary networks that these firms have developed and paid for entirely themselves .

A Model of Electronic Commerce

Company Web sites range from passive to active. At one extreme are the relatively simple, passive Web sites that provide only product information and the company address and phone number, much like a traditional brochure would do. At the other extreme are the relatively sophisticated, active Web sites that enable customers to see products,

services, and related real-time information; and actually conduct purchase transactions on line. Figure bellow shows a model of electronic commerce with five phases: Information gathering, ordering, payment, fulfillment, and service and support. Firms now advertise their offerings to prospective customers through Internet email and the Web. Customers can order and pay for products and services online. If the product or service can be digitized, it can be delivered online, as in the case of information-based products, videos, and software.

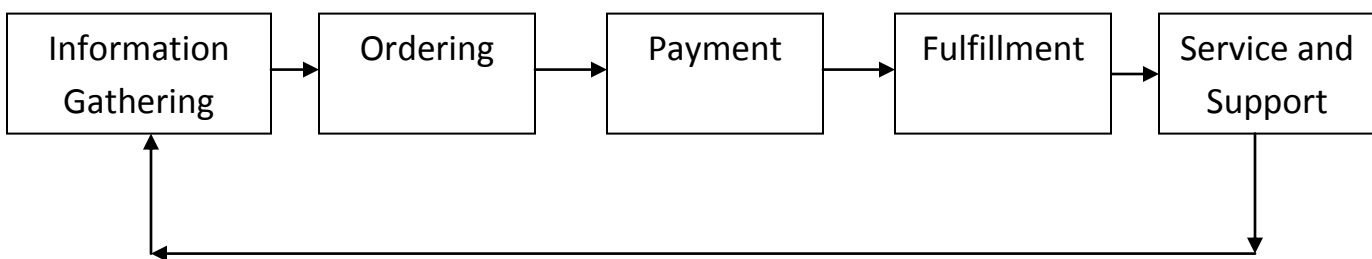


Figure 2 a model of electronic commerce

Figure 3 shows three possible modes of EC using the Internet. The term used to describe transactions between individuals and firms is Internet-based EC. Intranet, on the other hand, refers to use of the Internet within the same business, and extranet refers to the use of the Internet between firms.

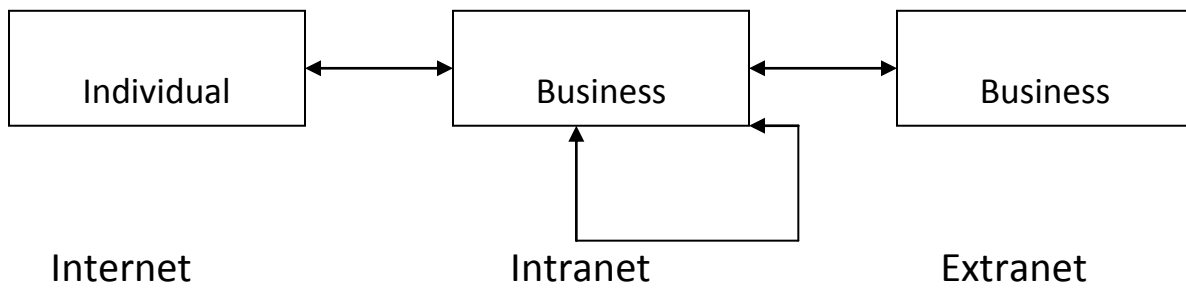


Figure3: Three Possible Modes of Electronic Commerce

Organizational of Information Systems

Every organization is composed of levels, as illustrated in Figure 1. As you might expect, given the vastly different types of activities that occur at different levels of an organization, each level can have vastly different informational needs with unique characteristics.

Operational Level

At the operational level of the firm, the routine day-to-day business processes and interaction with customers occur. At this level, information systems are designed automate repetitive activities, such as sales transaction processing. Operational-level systems are primarily designed to improve the efficiency of business processes and the customer interface. Managers at the operational level, such as foremen or supervisors, make day-to-day decisions that are highly structured and recurring. Figure 1 summarizes the general characteristics of the operational level.

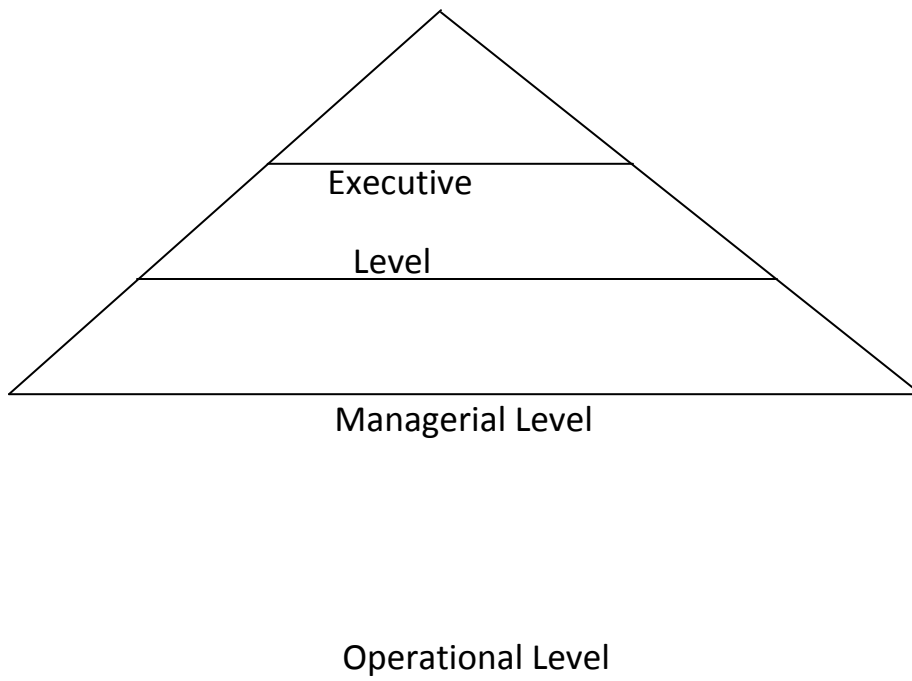


Figure 1: level of an organization

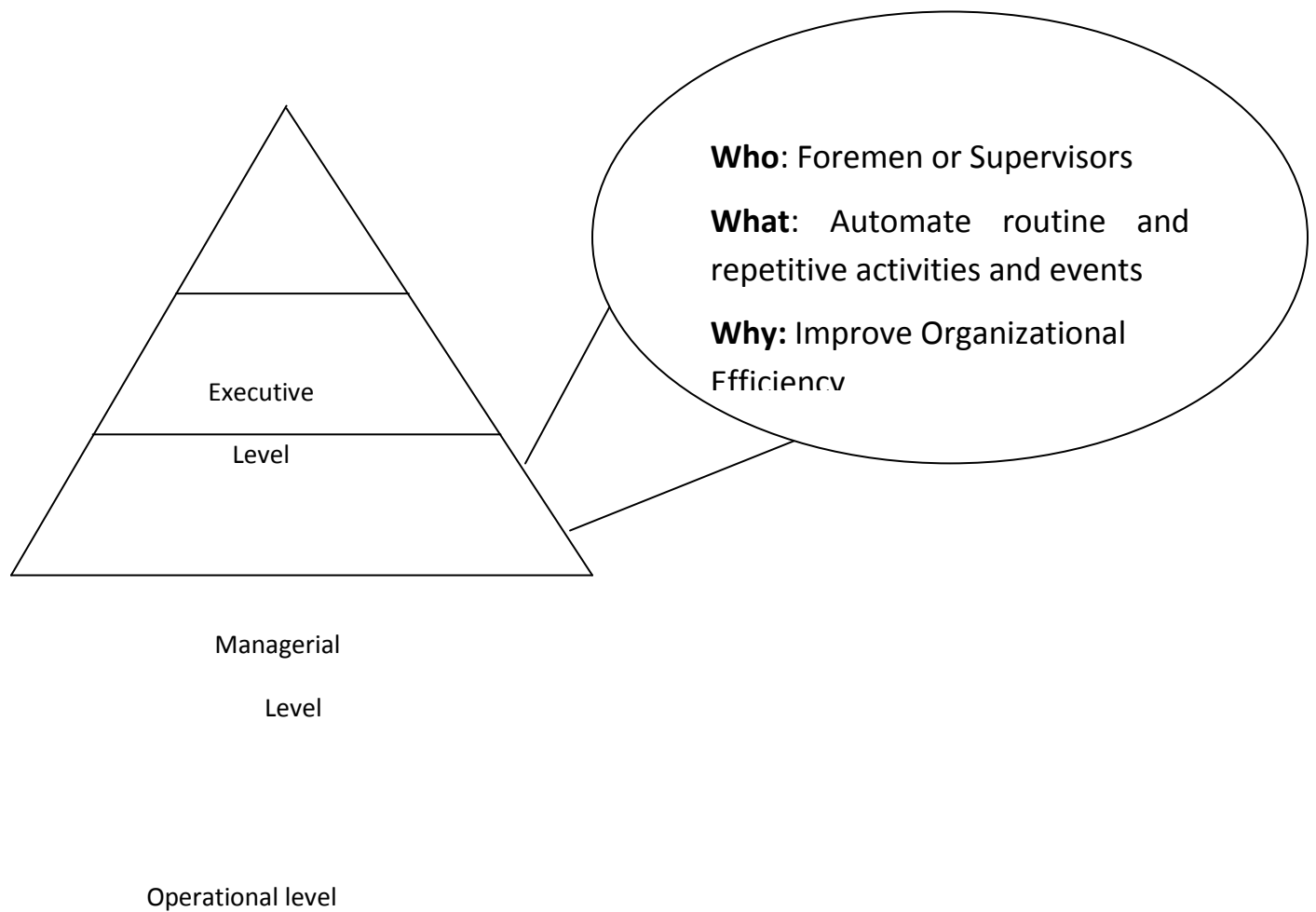


Figure 2: Operational level of an organization

Managerial Level

At the managerial level of the organization, functional managers focus on monitoring and controlling operational level activities and providing information to higher levels of the organization. Managers at this level often referred to as mid-level managers or functional managers (for example, marketing manager) focus on effectively utilizing and deploying organizational resources to reach the strategic objectives of the organization. Mid-level managers typically focus on problems within a specific business function, such as marketing. Managerial-level decision making is generally referred to as ***semi-structured*** decision making because solutions and problems are not clear-cut and often require judgment and expertise. For example, an information system could provide a production manager with summary information about sales forecasts for multiple product lines, inventory levels, and overall production capacity;

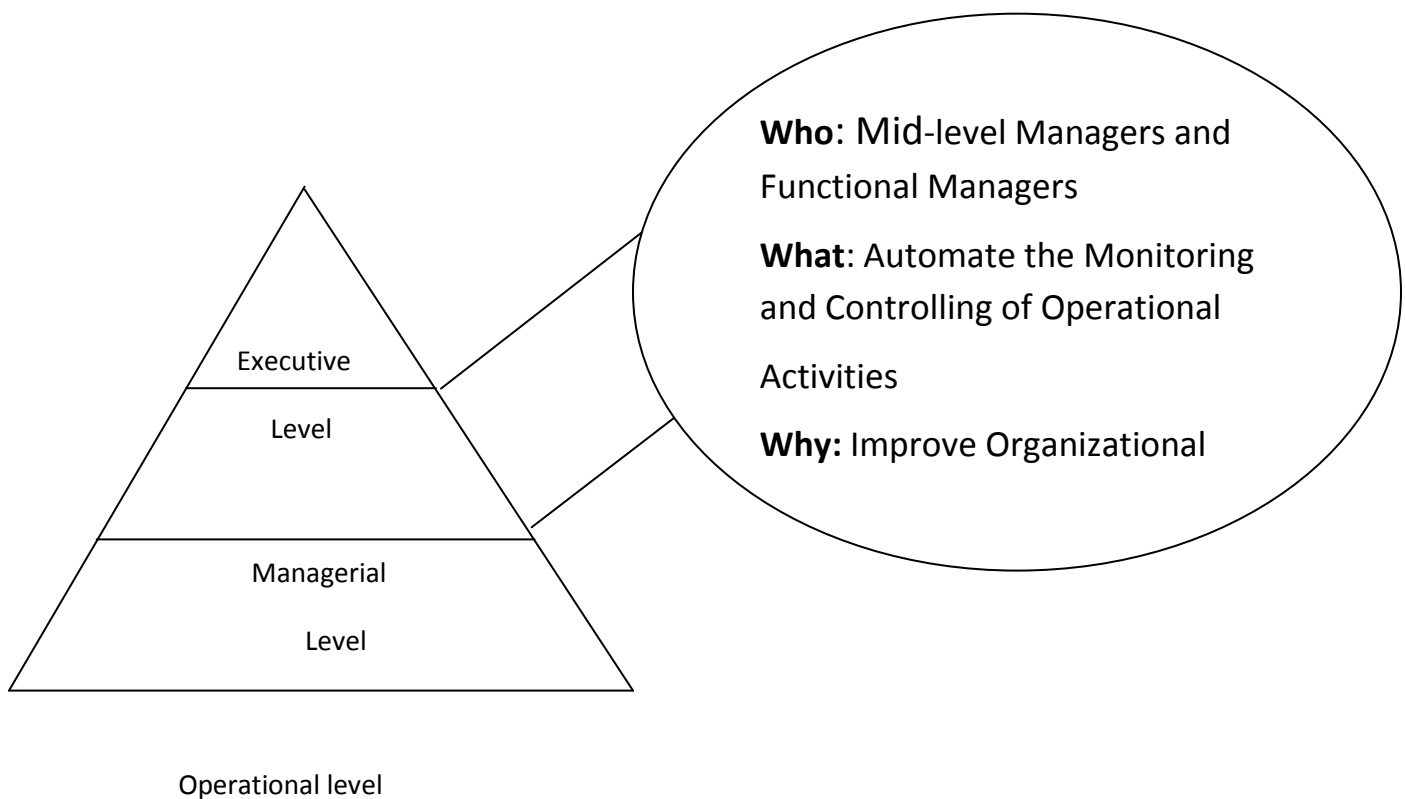


Figure 3: Managerial level of an organization

Executive Level

At the executive level of the organization, managers focus on longer-term strategic issues facing the organization. Managers at this level include the president and chief executive officer (CEO), vice presidents, and possibly the board of directors. Executive-level decisions are often very complex problems with broad and long-term ramifications for the organization. Executive-level decision making is often referred to as being ***messy or ill-structured*** because executives must consider the ramifications of their decisions on the overall organization; understanding how a given decision impacts the overall organization makes executive decision making extremely complex. For example, top managers may decide to develop a new product or discontinue an existing one. Such a decision may have vast, long-term effects on the organization. Information systems are used to obtain aggregate summaries of trends and projections of the future to assist executive-level decision making Figure 4 summarizes the general characteristics of the executive level.

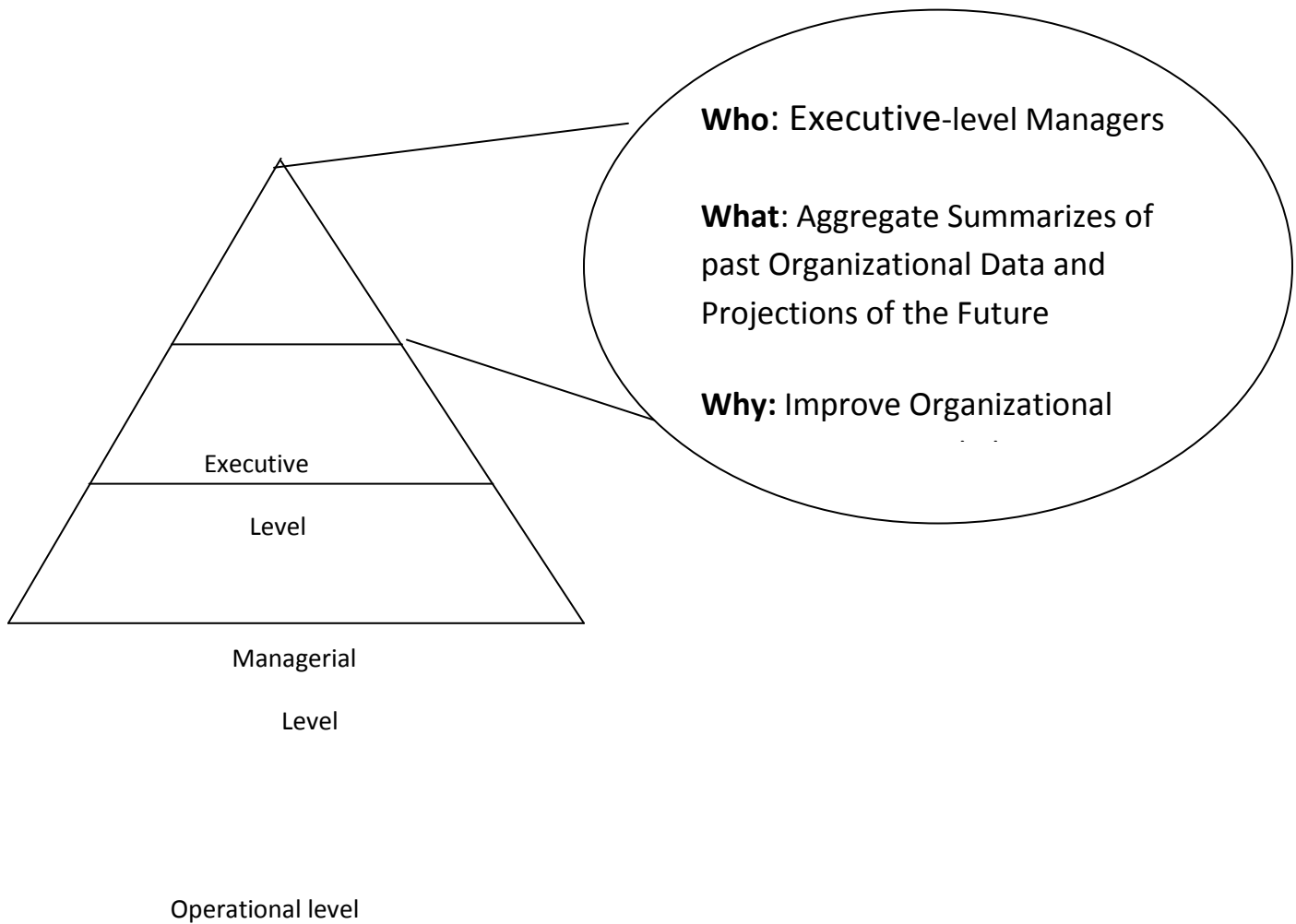


Figure 4: Executive level of an organization

Emerging information system

Competitive advantage is usually achieved when a company differentiates its product and service offering from those of its competitors or operates at a lower cost structure than its competitors. Successful organizations typically have a strong competitive advantage, and smart organizations are continually working to either gain or sustain competitive advantage.

The Nature of Emerging Systems

Many emerging technologies are focused on accomplishing two goals. The first goal is to support the work of **virtual teams** people using technology to collaborate together and effectively to solve problems across time and distance. The second goal is to create and better **customer contact** by integrating existing internal company systems for accounting, ordering, and billing, with telephones and personal computers via the internet and enabling customers to have more direct contact with these internal systems.

One of the primary underlying technology drivers of emerging information systems is **technology convergence**. Devices that have long been separate kinds of technologies, such as telephones, computers, and video recorders, are converging.

Implementing Emerging Systems

The development and use of technologies for virtual teamwork and for improved customer contact have grown considerably in the past several years. The technologies for virtual teamwork such as videoconferencing for customer contact include the internet and World Wide Web.

Videoconferencing

Many organizations are conducting ***Videoconferencing***, and the demand for Videoconferencing equipment is growing quickly. For example, sales for picture a leading Videoconferencing company grew from \$37 million in 1990 to almost \$500 million in 1997.

Desktop Videoconferencing

Desktop videoconferencing represents a second generation of video communication that has been enabled by the growing power of personal computer processor. A desktop system usually has a fast personal computer, a small camera (often with fixed focus though zooming and panning features are available), a speaker telephone or separate microphone, videoconferencing software, and a special video

board installed inside the computer. Most desktop videoconferencing systems, like the one in Figure 1, have three key features.

1) They easily available on a user's so users no longer have to schedule or go to a conference room to use the group videoconferencing facility.

2) Desktop videoconferencing units can support software application sharing. Application sharing enables two people to collaborate using software on their personal computers in separate locations.

3) Desktop videoconferencing units is shared white boarding software. White boarding software enables users to draw with a mouse or type text and display it remotely to another unit.

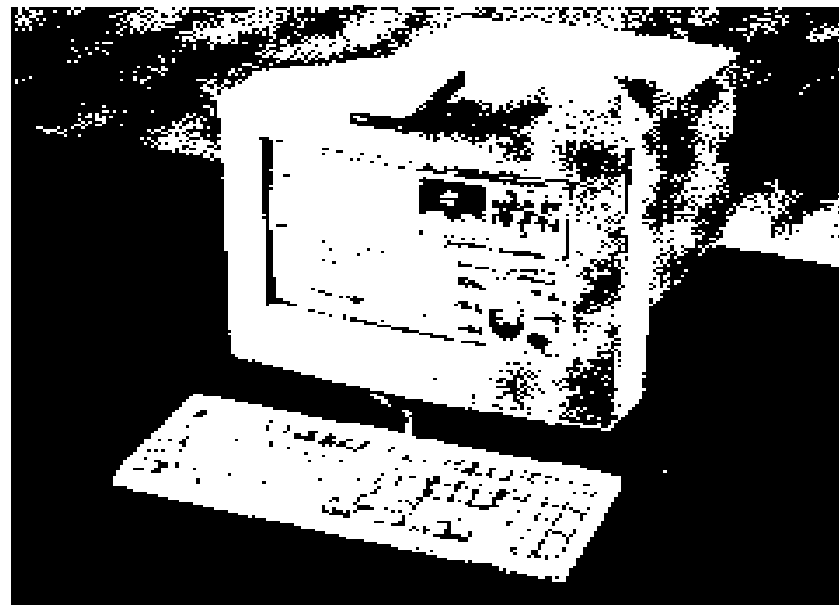


Figure 1: Desktop Videoconferencing

Limits to Videoconferencing

Although videoconferencing is a promising new technology that is growing rapidly development and use, it has limits.

1) One problem with desktop videoconferencing is the cost of providing digital telephone lines to many offices. It is relatively easy to pick up a standard analog telephone and place a call to most of the world.

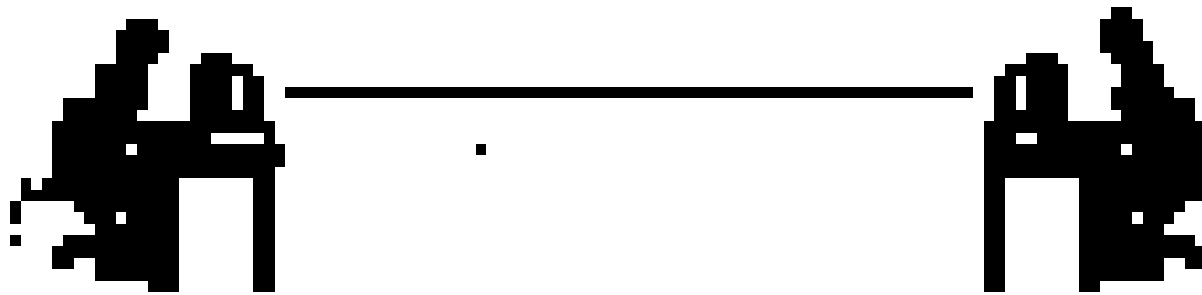
2) Another limit to desktop videoconferencing using digital phone lines is the lack of a universally agreed upon standard, which is essential for widespread adoption of videoconferencing. Companies are understandably reluctant to invest in any unit that may not be able to communicate with units made by another company.

3) One other limit to most videoconferencing units is that they are ***point-to-point***; that is there are only two locations involved what if you need to meet with colleagues

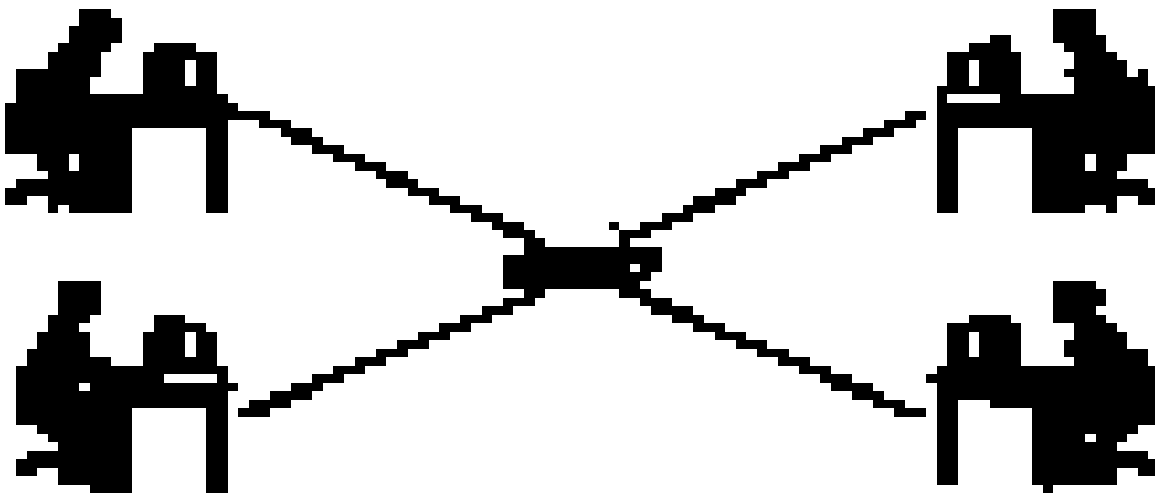
Can every one videoconference together at same time. Assuming that everyone has access to videoconferencing systems and digital telephone lines, it is possible to have ***a multipoint*** conference. One way is to use a bridge, a device linking multiple videoconferencing units

together that is sometimes called a ***multipoint control*** unit (MCU).

Point-to-point and multi- point conferencing are depicted in Figure 2



a) point to point videoconferencing



b) Multipoint videoconferencing

Figure 2: videoconferencing types

The Need for Structured Systems Development

The process of designing, building, and maintaining information systems is often referred to as **systems analysis and design**. The individual who performs this task is referred to as a **systems analyst**.

The Evolution of Information Systems Development

In the early days of computing, systems development and programming was considered an art that only a few technical “gurus” could master. Unfortunately, the techniques used to construct systems varied greatly from individual to individual. This variation made it difficult to integrate large organizational information systems. Many systems were not easily maintainable after the original programmer left the organization. As a result, organizations were often left with systems that were very difficult and expensive to maintain. Many organizations therefore under-utilized these technology investments and failed to realize all possible benefits from their systems.

To address this problem, information systems professionals concluded that system development needed to become engineering. Common methods, techniques, and tools had to be developed to create a disciplined approach for constructing information systems. This evolution from an “art” to a “discipline” led to use of the term **software engineering** to help define what systems analysts and programmers do., if all systems analysts.

Steps in the Systems Development Process

The products that a firm produces and sells follow a life cycle, so do organizational information systems. The term **systems development life cycle (SDLC)** is used to describe the life of an information system from conception to retirement. The SDLC has five primary phases:

- 1. System identification, selection, and planning**
- 2. System analysis**
- 3. System design**
- 4. System implementation**
- 5. System maintenance**

Figure 1 is a graphical representation of the SDLC. The SDLC is represented as boxes connected by arrows. Within the SDLC, arrows

flow in both directions from the top box (System Identification, Selection, and Planning) to the bottom box (System Implementation).

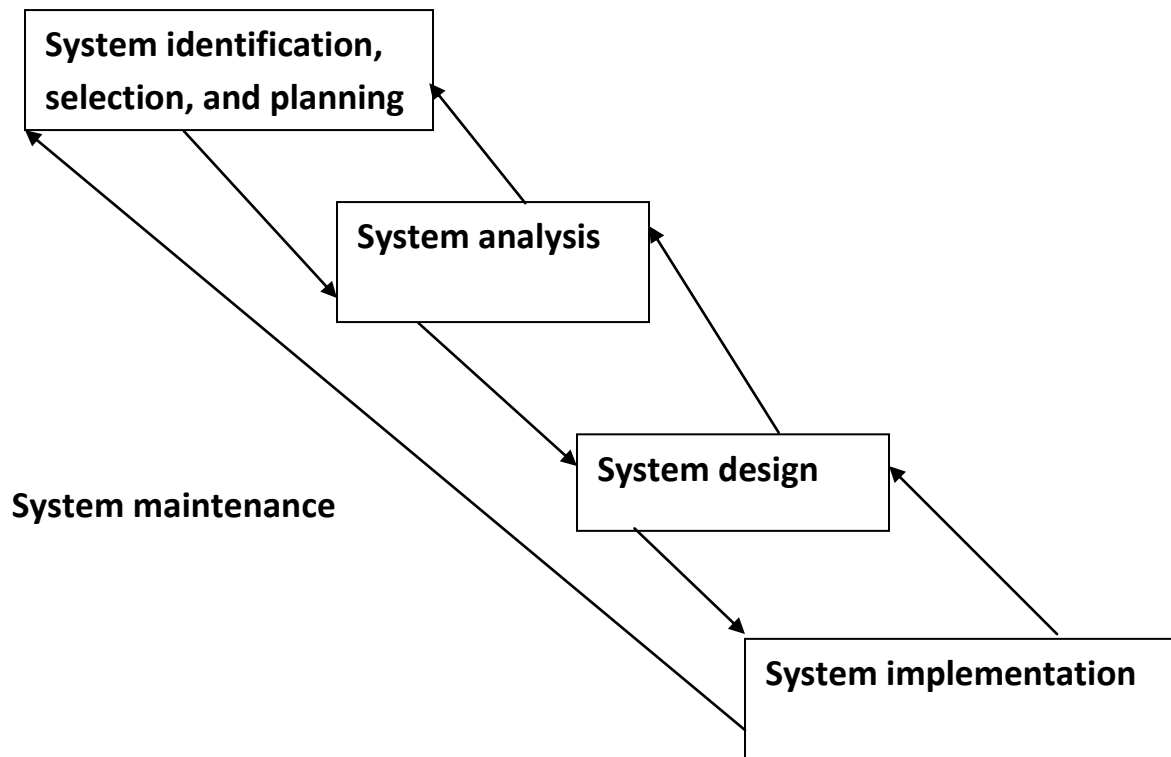


Figure 1: systems development life cycle (SDIL)

Phase 1: System Identification, Selection, and Planning

The first phase of the systems development life cycle is system *identification, selection, and planning*, as shown in Figure 2. Given that an organization can work on only a limited number of projects at a

given time due to limited resources, care must be taken so that only those projects that are critical to enabling the organization's mission, goals, and objectives be undertaken. The goal of system identification and selection is simply to identify and select a development project from all possible projects that could be performed. Organizations differ in how they identify and select projects. Some organizations have a formal **information systems planning** process where a senior manager, a business group, or IS manager, identify and assess all possible systems development projects that an organization could undertake.

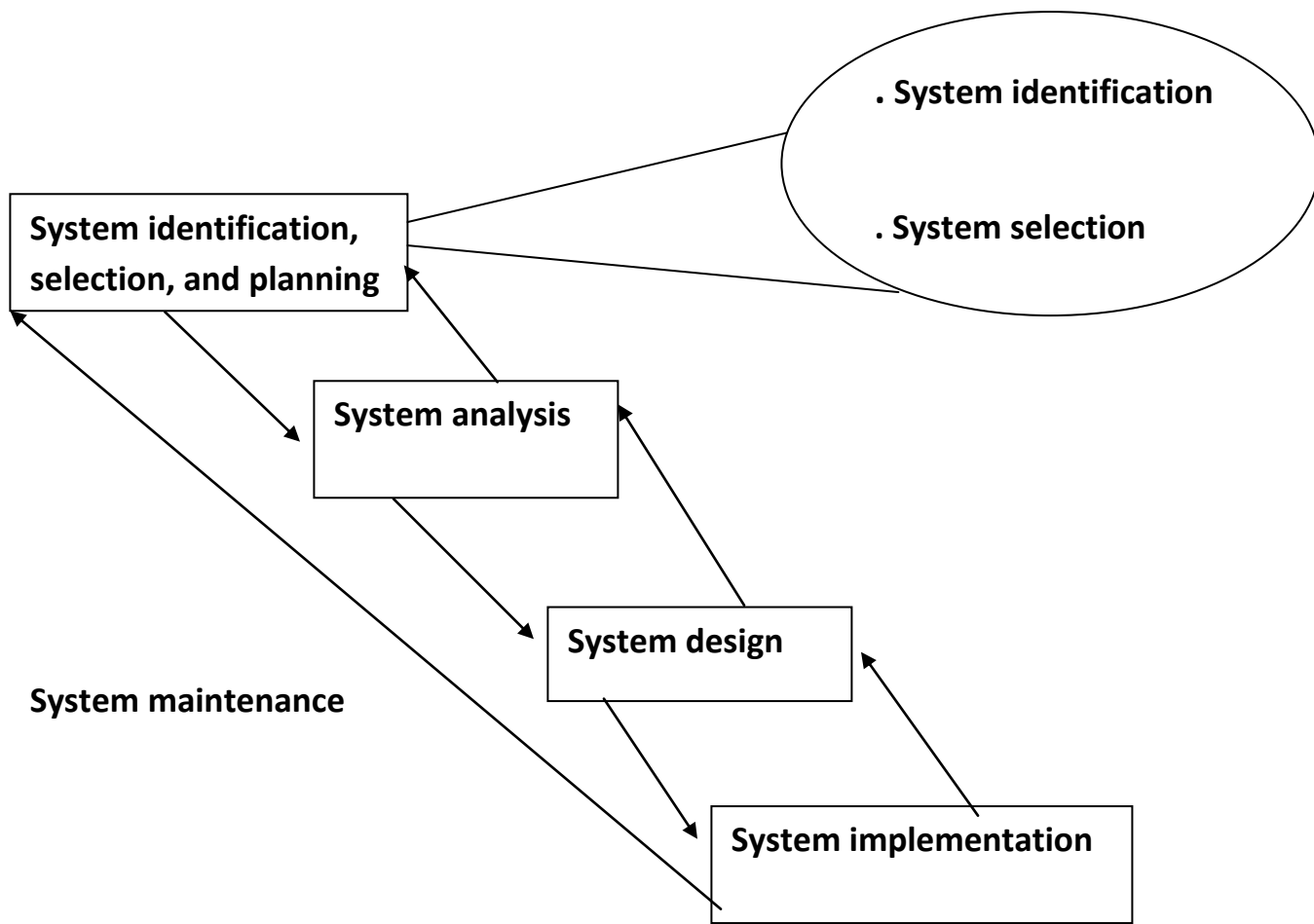


Figure 2: systems development life cycle (SDIL) with phase 1

Phase 2: System analysis

The second phase of the system development life cycle is called system analysis, as in figure 3 .one purpose of the system analysis phase for designers to gain through understanding of an organization's way of doing things in the area for which the new information system will be constructed. The process of conducting an analysis requires many tasks or sub phases.

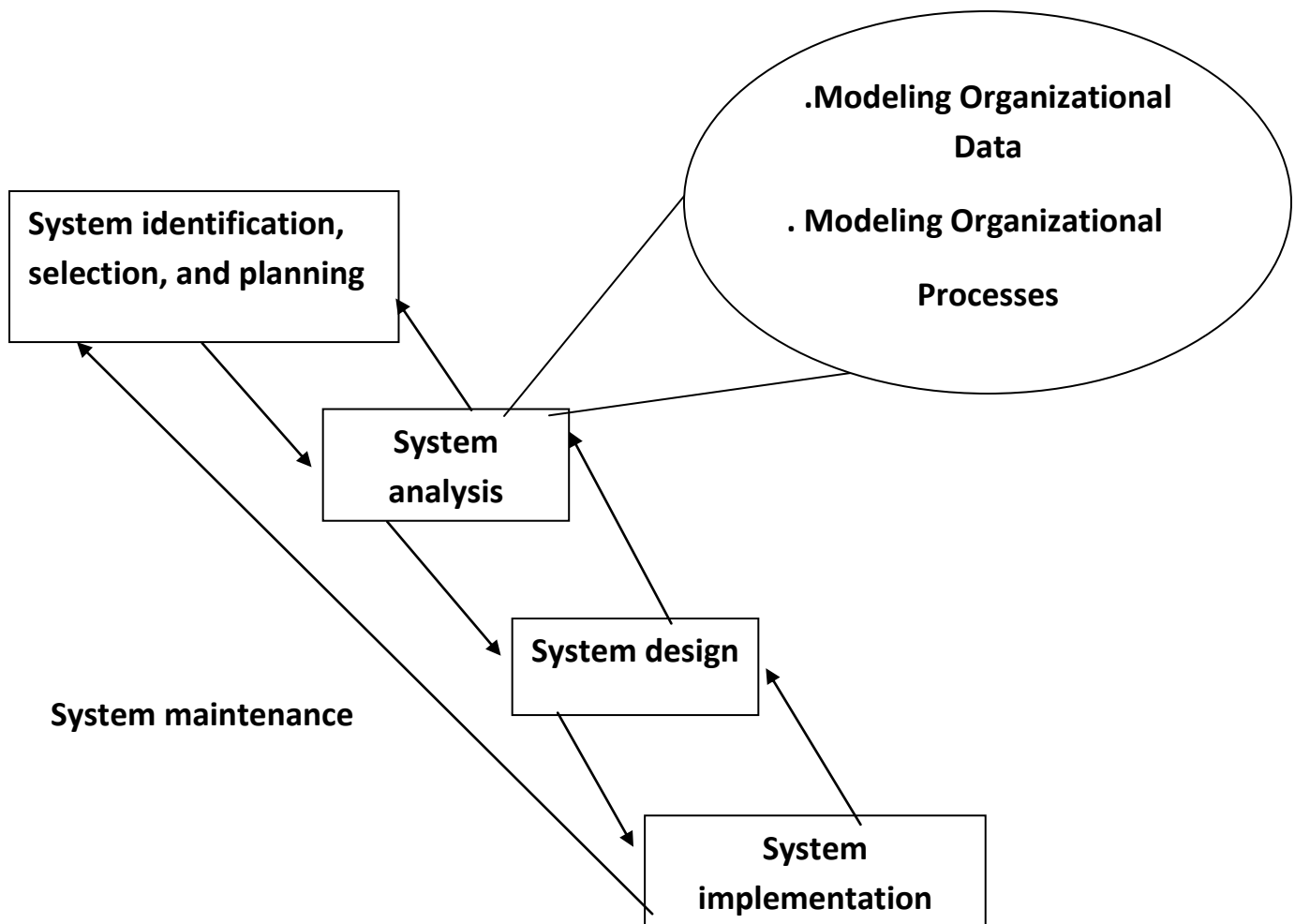


Figure 3: systems development life cycle (SDIL) with phase 2

Phase 3: System design

The third phase of the systems development life cycle is system design, as shown in figure 4. during this phase the proposed system is designed, the details of the particular approach chosen are developed. Many different activities must occur during system design.

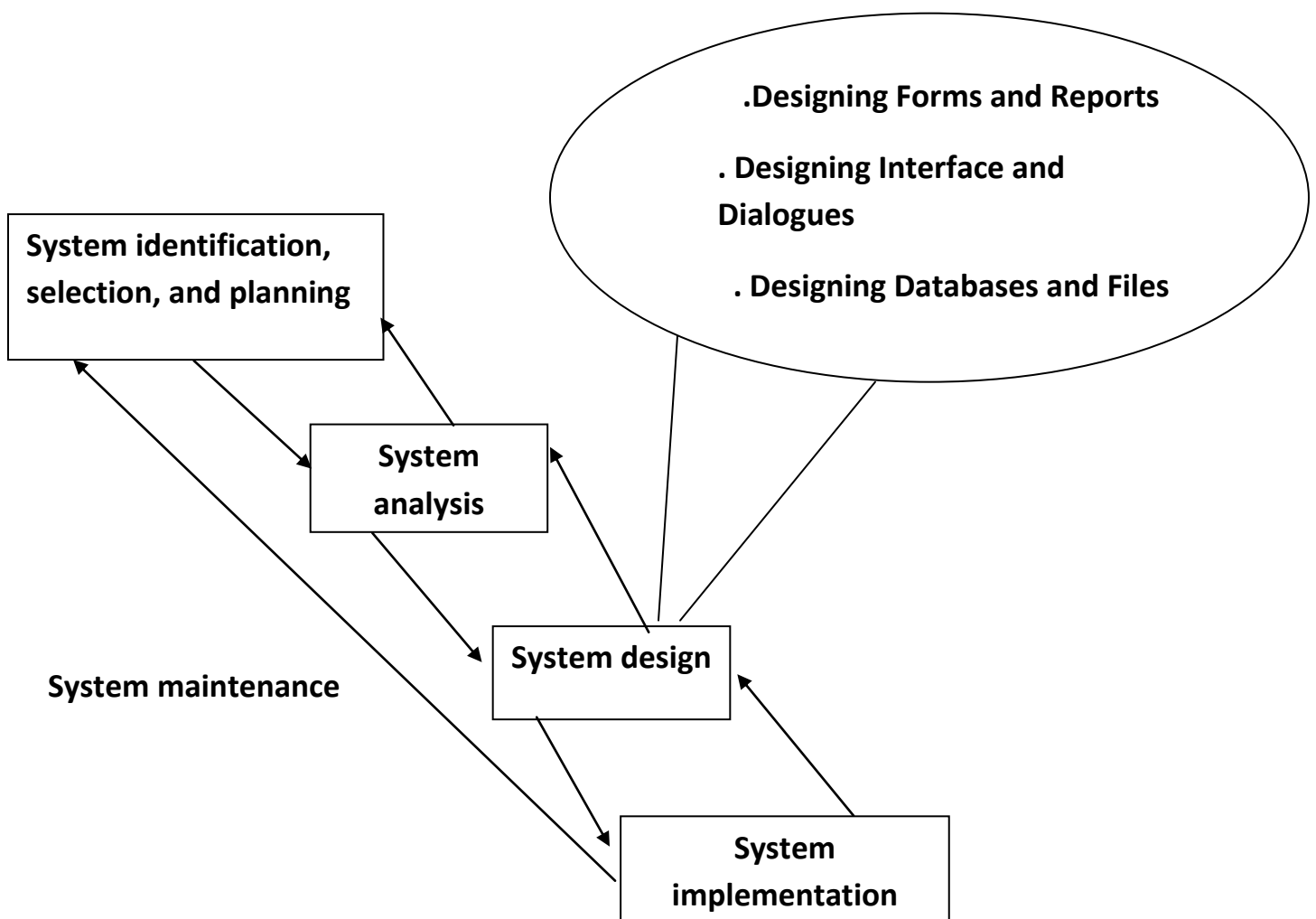


Figure 4: systems development life cycle (SDIL) with phase 3

Phase 4: system implementation

The fourth phase of the systems development life cycle is system implementation, as in Figure 5 there are different activities :

- 1) One group of activities focuses on transforming the system design into a working information system that can be used by the organization. These activities include software programming and testing.
- 2) A second group of activities focuses on preparing the organization for using the new information systems. These activities include system conversion, documentation, user training, and support.

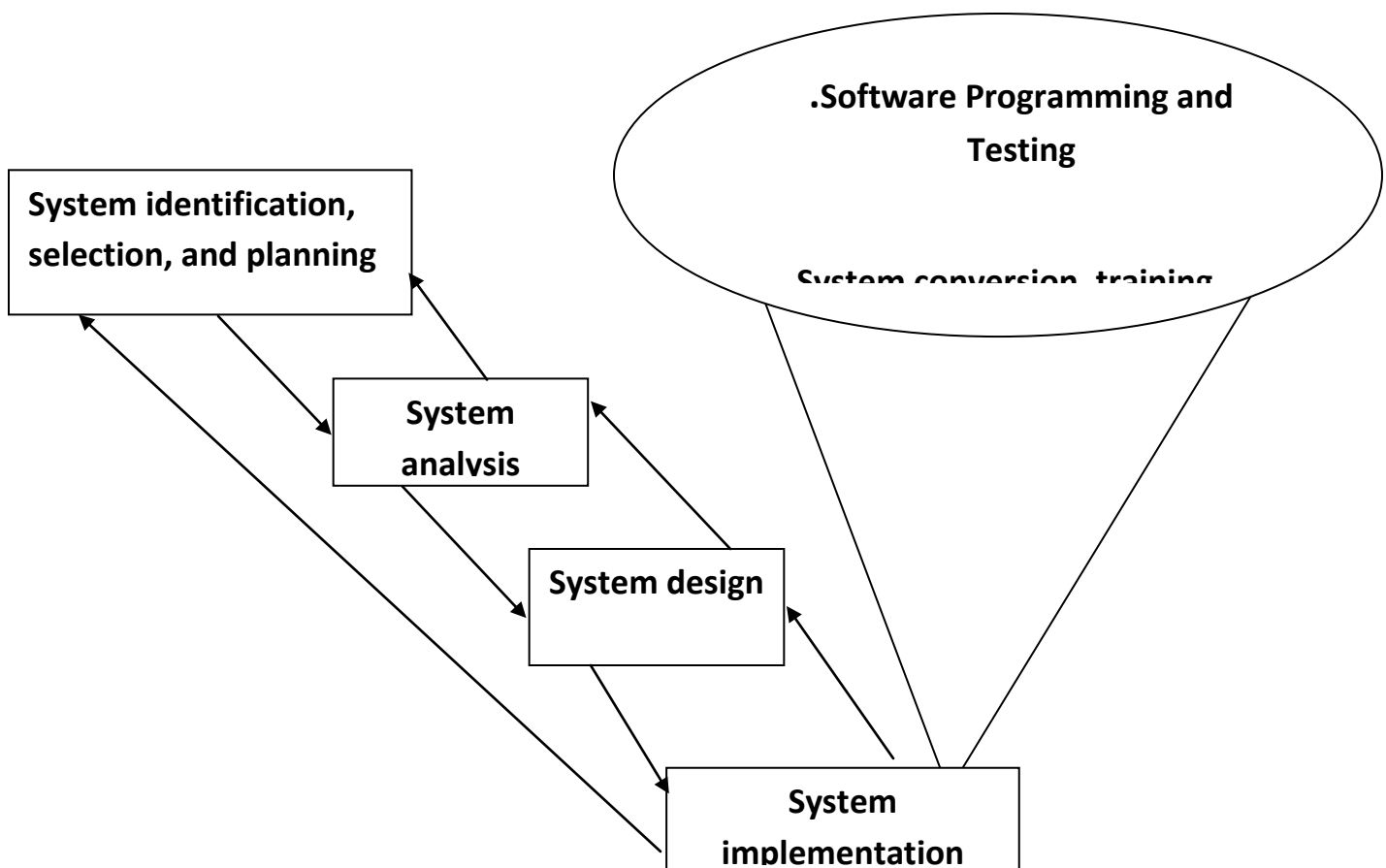


Figure 5: systems development life cycle (SDIL) with phase 4

Phase 5: system maintenance

After an information system is installed, it is essentially to maintain. In the maintenance phase, one person within the systems development group is responsible for collecting maintenance requests from system users. After they are collected, requests are analyzed so that the developer can better understand how the proposed change might alter the system and what business benefits and necessities might result from such a change. If the change request is approved, a system change is designed and then implemented, as shown in Figure 6.

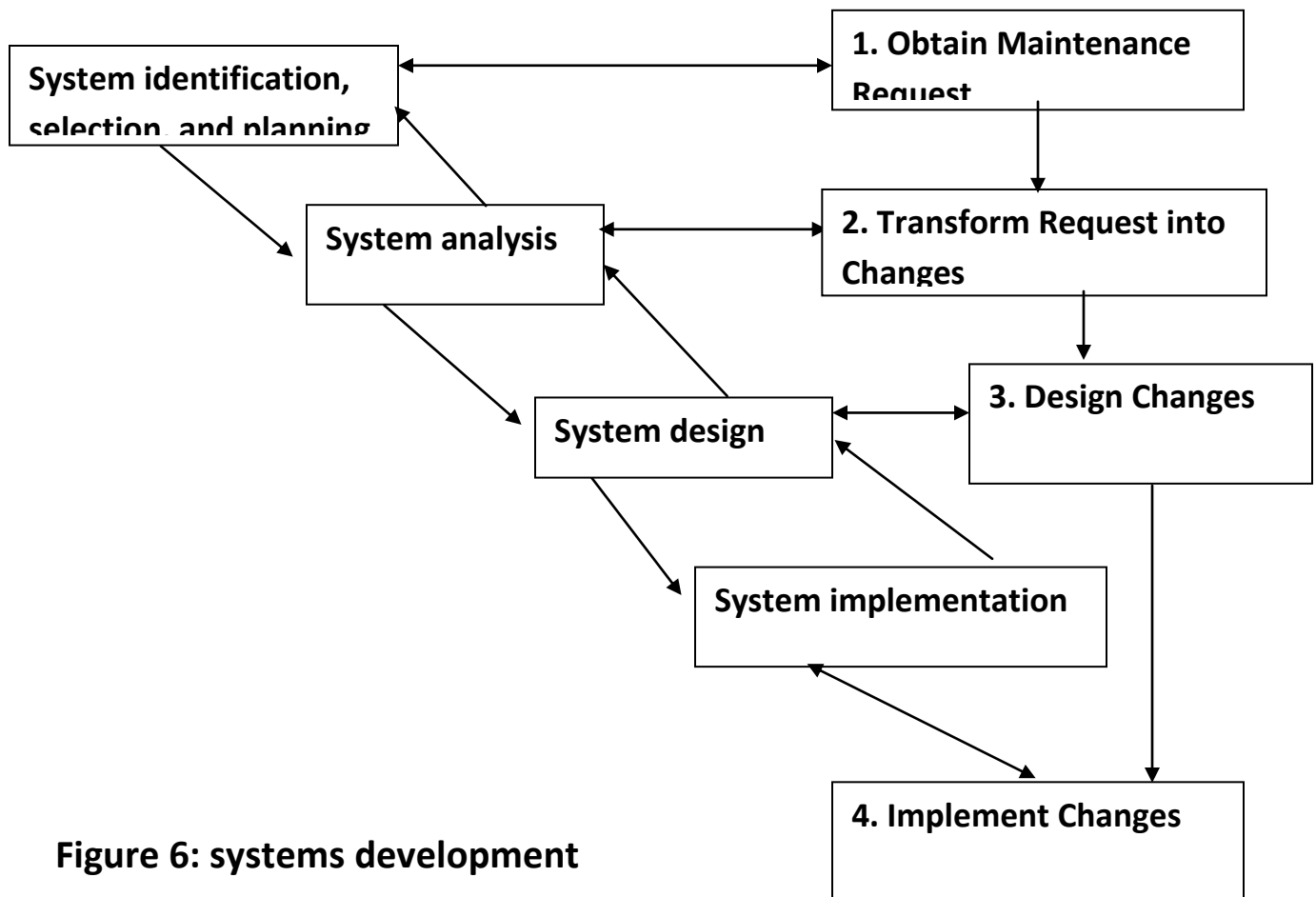


Figure 6: systems development life cycle (SDIL) with phase 5

Information system development approaches

System analyst's works closely with users to determine what is needed from the proposed system .Analysts have traditionally asked users what information they need to have put into the system and what types of information they need back from the system to do their job well. There are different methods for collecting system requirements such as

1) Critical Success Factors (CSF)

The Critical Success Factor (CSF) methodology for collecting system requirements define their information system needs .It is still quite popular today as a way to obtain a useful set of system requirements from users. A Critical Success Factor, or CSF,is something that must go well to ensure success for a manager, department, division, or organization.

How the CSF Approach Works

To understand an organization CSFs, a systems analyst interviews people throughout the organization and asks each person to define her own personal CSFs. After the analyst collects these individual CSFS, he can merge, consolidate, and refine them to identify a broad set of organization wide CSFs, as shown in Figure 1.

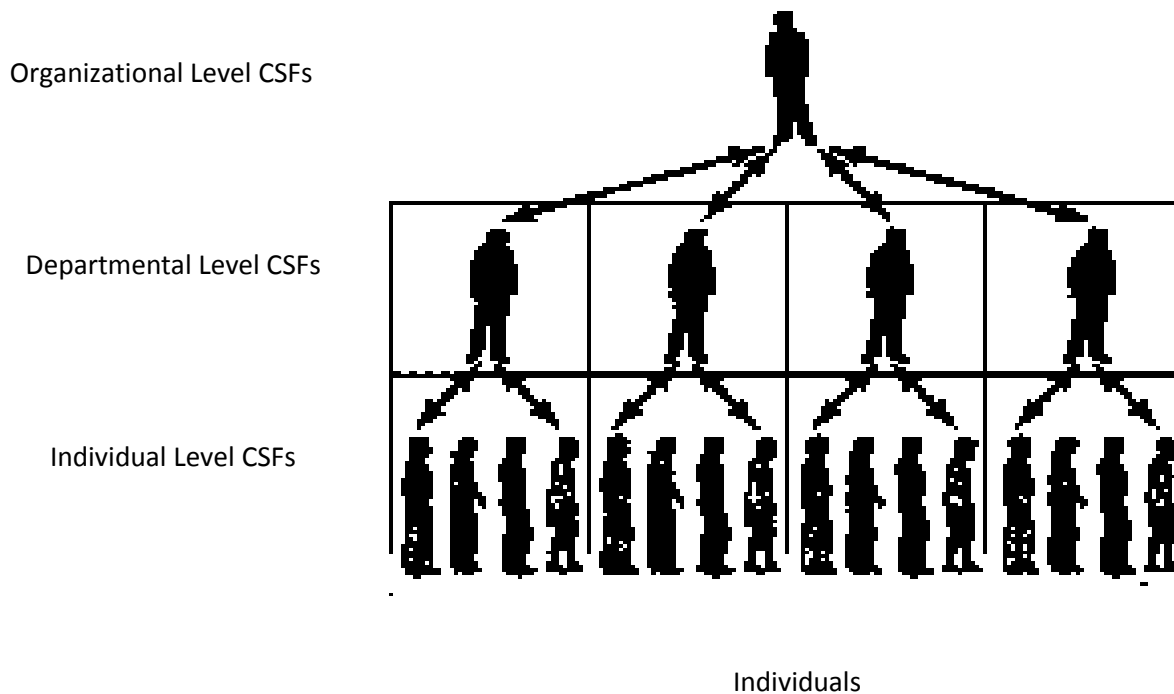


Figure 1: merging individual CSFs to represent organization

Strengths and Weaknesses of the CSF Approach

Strengths

- 1) The greatest strength of the CSF approach is that senior managers intuitively understand the approach and support its usage.
- 2) A second strength is that the CSF approach provides a way to understand the information needs of the organization in order to make effective decision.

Weaknesses

- 1) The method's high-level focus can lead to an oversimplification of a complex situation. For example, people have a limited capacity for dealing with complexity and a limited capacity for keeping track of information.
- 2) Second weakness centers on the difficulty of finding analysts trained to perform the CSF process that must both understand information systems and be able to effectively communicate with senior executives.
- 3) A third weakness of the CSF approach is that this method is not user-centered; that is, it relies on an expert systems analyst to glean requirements from users and to organize them appropriately.

2) Joint Application Requirements (JAR) Joint Application Design (JAD)

Joint Application Requirements (JAR) and Joint Application Design (JAD) are methods for collecting requirements and creating system designs. Most often, people refer to both JAR and JAD as simply JAD. The defining aspect of JAD is that "joint" really means group. The JAD method is a group-based approach for collecting system requirements and for setting system design specifications.

When collecting system requirements and following the guidelines of the SDLC, a system analyst interviews potential users of the new information system

individually to understand each user's needs. During this process, the analyst may interview a large number of users.

In contrast to the SDLC approach to determining systems requirements, a JAD is a special type of a group meeting in which all users meet with the analyst at the same time. During this meeting, all users jointly define and agree upon system requirement designs. This process has resulted in dramatic reductions in the length of time needed to collect requirements or specify designs.

How the JAD Approach Works

The JAD meeting can be held in a normal conference room or special purpose JAD room. Figure 2 shows a sample JAD room. JAD meeting rooms are often designed much like a classroom, with facilities for presenting information to the group. Most JAD rooms have overhead projectors, whiteboards, flip charts, and computers to assist in making presentations and to help in recording the ideas and deliberations of the group.

Strengths and Weaknesses of JAD

The JAD approach to systems development provides several advantages.

Strengths

- 1) First, the group based process enables more people to be involved in the development effort without adversely slowing the process.
- 2) It can also result in a system of much higher quality. Additionally, because user involvement eases implementation (that is, users w involved in defining what the system would do and how the system would operate)

3) Training and support costs for developing the system can be significantly lower.

Weaknesses

1) First, it is often very difficult to get all relevant users to the same place at the same time to hold a JAD meeting. Large organizations may have users virtually all over the world getting them all to a meeting (or a series of meetings) would be extremely difficult and expensive

2) A second weakness of JAD relates to the inherent problems that groups may face especially large groups. Have you ever worked in a group in which one person dominated? Or, have you ever experienced a situation where some people in the group were shy and didn't want to talk? How about working in a group where one or more of the members simply chose not to help and let the other members of the group do the work?

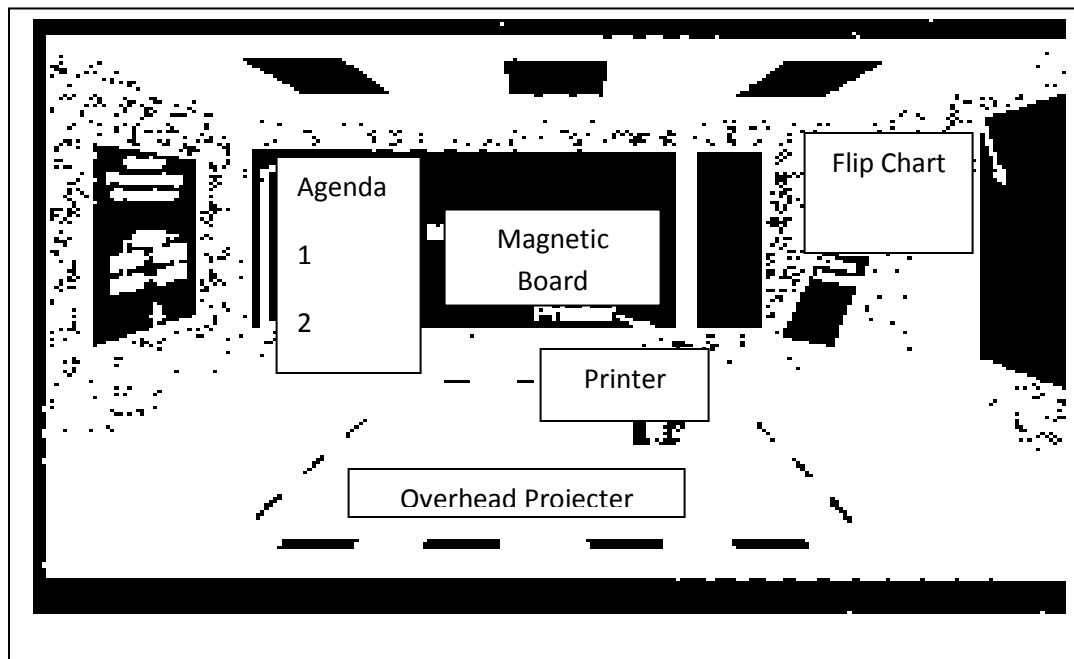


figure2: A JAD room

3) Prototyping

Prototyping is a systems development methodology that uses a “trial and error” approach for discovering how a system should operate. You probably use prototyping all the time in many of your day-to-day activities, but you just don’t know it! For example, when you buy new clothes you likely use prototyping that is, trial and error by trying on several shirts before making a selection. Likewise, when you buy a new car, computer or even when you choose a mate, you use a trial-and-error process. When prototyping is used to design a new system, the systems designer works with users in a trial-and-error process until the system works the way the users want it to work.

How Prototyping Works

Figure 3 shows the prototyping process when applied to identifying determining system requirements. To begin the process, the system designer interviews one or several users of the system, either individually or as a group using a JAD. After the designer gains a general understanding of what the users want, he develops a prototype of the new system as quickly as possible to share with the users. The users may like what they see or ask for changes. If changes are requested, the designer modifies the prototype and again shares it with the users. This process of sharing and refinement continues until the users approve the functionality of the system.

Strengths and Weaknesses of Prototyping

Strengths

- 1) The greatest strength of prototyping is that the process helps develop a close working relationship between the system designers' users. This relationship helps build trust and acceptance for the new system.
- 2) Second strength of prototyping is that it is arguably the best systems development method for identifying how a system should operate when the system's specifications are hard to define.

Weaknesses

Prototyping also has numerous weaknesses.

- 1) First prototyping is not appropriate for developing every type of information system. For example, prototyping is very problematic in projects with a large number of users that must be consulted during the design process; requiring the systems analyst to consult with more than just a few users not only increases the complexity of the process, but also significantly slows the process
- 2) Another weakness of prototyping is that the process itself often results in not spending enough effort on important activities within the development process. Consequently, the system development process can be rushed which can result in inadequate analysis and design, poor testing, and little or no documentation. Systems that lack maintainability due to inadequate documentation or some

other factor cost the organization significantly more resources to maintain than do systems that are adequately documented.

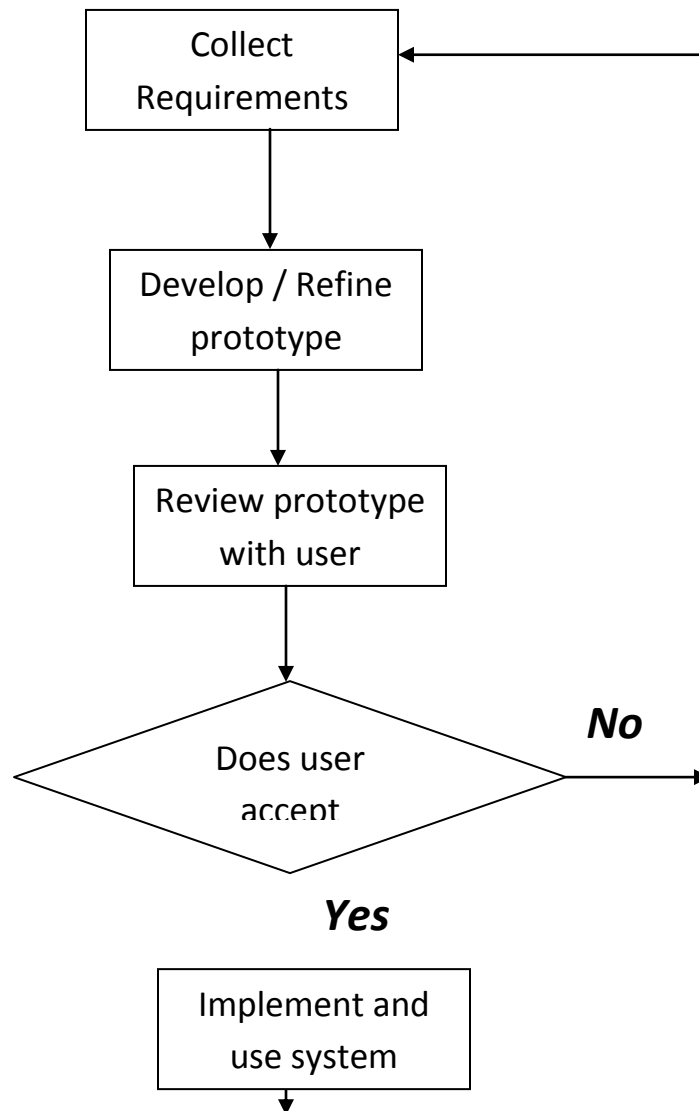


Figure 3: the prototype process

4) Rapid Application Development (RAD)

Rapid Application Development (RAD) is a four-phase systems development methodology that combines prototyping, computer-based development tools, special management practices, and close user involvement

How Rapid Application Development Works

RAD has four phases: 1) requirements planning, 2) user design, 3) construction, and 4) the move to the new system. Phase 1, requirements planning similar to the first two phases of the SDLC, in which the system is planned and requirements are analyzed. To gain intensive user involvement, the RAD methodology encourages the use of JAD sessions to collect requirements. 'Where RAD becomes radical is during Phase 2, where users of the information system become intensively involved in the design process. RAD is a process in which requirements, designs, and the system itself are developed via iterative refinement, as shown in Figure 4.

In a sense, with the RAD approach the people building the system and the users of that system keep cycling back and forth between Phase 2 (user design) and Phase 3 (construction) until the system is done. As a result, RAD requires close cooperation between users and designers to be successful.

Strengths and Weaknesses of Rapid Application Development

Strengths

- 1) The greatest strength of RAD is the active involvement of users in the development process. With active user involvement, it is much more likely that the system being developed will actually meet their needs.
- 2) User involvement eases many of the training and installation activities associated with the creation of a new system. Because the users were involved from the beginning, the new system is viewed as “their” new system.

Weaknesses

- 1) A weakness of RAD is that some people believe it may not be a good approach for developing systems that do not “need” to be developed rapidly (Due to RAD’s accelerated analysis approach, systems built using it are often limited in functionality and flexibility for change.
- 2) In addition due to the emphasis on the speed of design and development, systems developed using RAD may not be of the highest possible quality

Requirements and Design by analysts

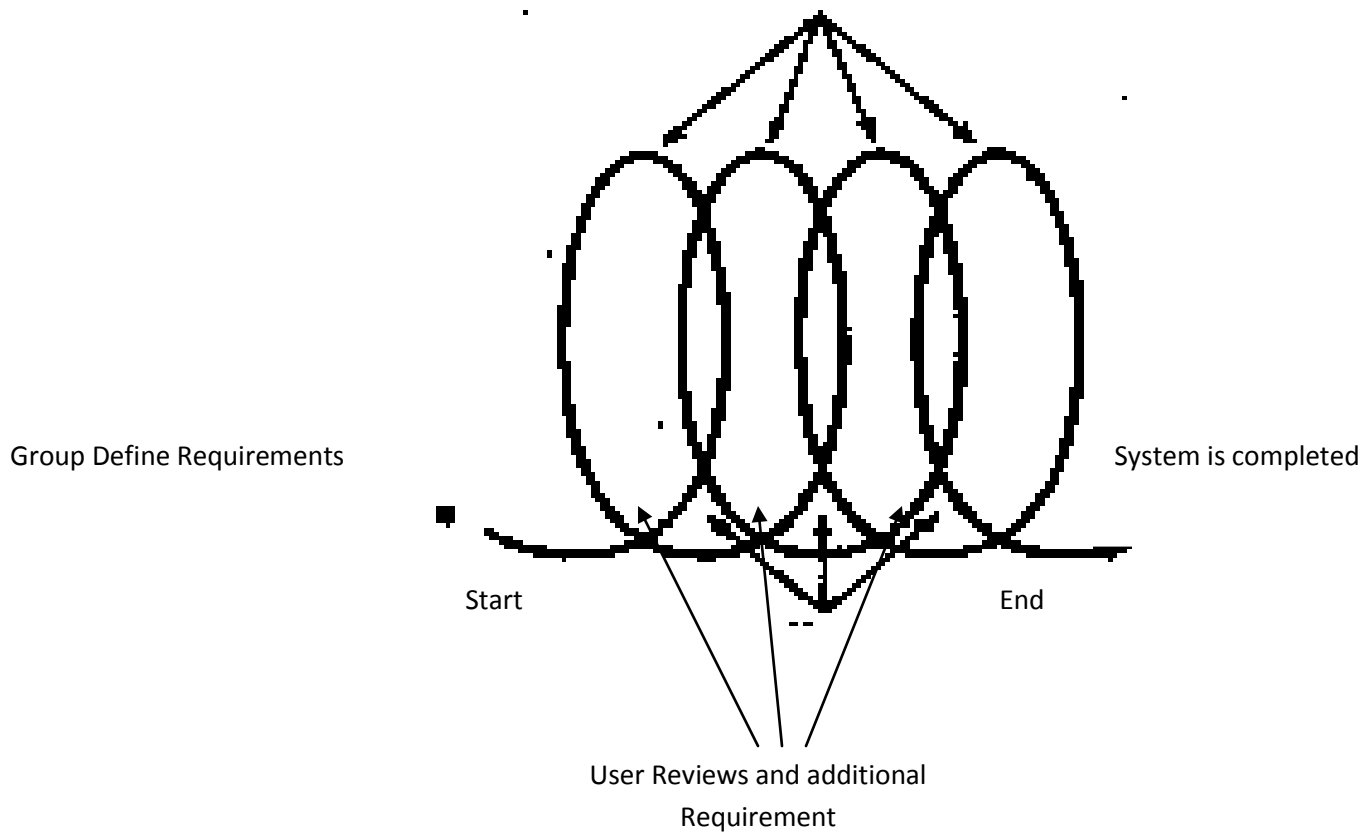


Figure 4: iterative refinement is a key to the success of RAD.

The importance of successfully managing information systems

Managing information systems well can help an organization save money and improve productivity. While the cost of computing power and storage is declining, the overall costs to develop, implement, and maintain organization wide information systems are growing.

key Issues in the Management of Information System

The management of information systems will become increasingly important as you progress through your career and begin to manage or participate in information systems projects.

The Functions of Management

The functions of management are now typically grouped into four categories planning, organizing, leading, and controlling as follow:

Planning:-Defining an organization's goals, establishing an overall strategy for achieving these goals, and developing a comprehensive, integrated set of sub plans to integrate and coordinate activities wide

Organization:-determining what tasks are to be done, who is to do them, how the tasks can best be grouped together, who reports to whom ,and where and how decision are to be made.

Leading: - motivating subordinates, directing the activities of others, selecting the most effective communication channel, and resolving conflicts among organization members.

Controlling:- monitoring the organization's performance, comparing the organization's actual performance with previously set goals, and then making any necessary changes to correct and improve the organization's performance.

Managerial Functions Applied to IS

Let's apply the four managerial functions to the management of the information system department within a firm. Table 1 describes some typical managerial functions for higher-level IS managers, such as the chief information officer (CIO), and typical, correspond functions for mid-or low-level information system managers, such as a project manager. You can see that the higher-level IS managers are more

focused on the big picture while the lower-level IS managers are more focused on managing day-to-day operations.

Table 1 describes some typical managerial functions for IS managers,

Managerial Functions	Higher-level IS Manager	Lower-Level IS Manager
Planning:	Create high-level plans for information systems deployment and ensure that information systems plans are project plan are make sure these information systems plans help achieve the organization's mission and goals.	Formulate a detailed, daily information systems projects plane with a systems development team.
Organization	Establish clear information systems architecture for the organization, which includes hardware, software, and networking standards to be followed and supported.	Determine who will serve on a particular information systems project team and where this team will do their work.
	Help define IS's new strategic role within the organization and motivate information focus more on the	Direct the activities of the project team members and resolve conflicts among

Leading:	quality of the systems they develop and manage and service they provide to others in the organization. systems personnel to others in the organization.	them.
Controlling	Coordinate the efforts of mid- and lower-level information systems managers to formally monitor and improve systems development quality and turn-around time. .	Monitor the progress of the project team and work with other information systems managers to determine ways to improve systems development performance

Techniques for Successful Information Systems Management

Given the complexity of information systems management, what can you do to manage information systems well? There are many

Techniques for Successful Information Systems Management such as

1) Elective Change Management

A model for organizational change, reproduced in Figure1 the successful change requires that we first “unfreeze” the status in the

organization, then help change to a new state, and finally ‘refreeze” the new change so that it becomes permanent. In the unfreezing stage, those who will be changing must feel a need for change and know that the atmosphere is safe for change. In the moving stage, the information needed to make the change must be provided, and this information must be assimilated by the individuals who are affected by the change. In the refreezing stage, the new behavior must become the routine behavior. At this point, the new behavior is viewed as ordinary instead of something different and special.

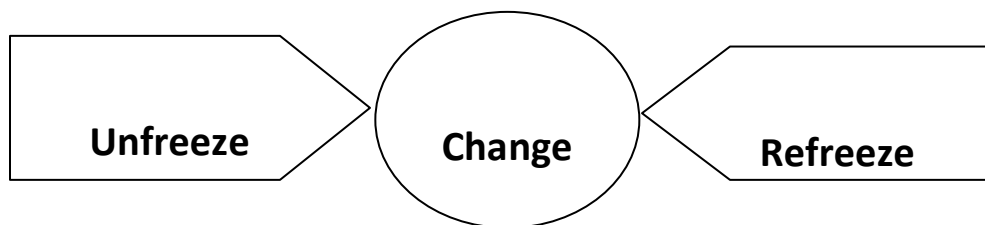


Figure1 the successful change

2) Overcoming Resistance to Change

Resistance can be overcome in several ways, as summarized in Table 2. Let's look at these methods in the information systems realm. For example, to counter opposition systems related changes, you must first try to look at the new system from the perspectives of other individuals

and departments. Try to understand the other parties' view points in order to determine where there is potential for resistance or why resistance already exists.

Table 2 Methods for overcoming resistance to change.

Method	Description
Communication and education	Communicate with employees; educate them on the need and logic for change.
Participation	Enable employees to participate in the decision making process concerning the change
Facilitation and support	Call in a professional change agent; provide employee counseling or therapy
Negotiation	Exchange something of value for a lessening of the resistance.
Manipulation and cooptation	Covertly attempt to influence employees who are resisting' give the leaders of a resistance group a key role in the change decision to appease them.
coercion	Use direct threats or force to lesson the resistance

3) Stakeholder Identification and Assumption Surfacing One potentially powerful technique for preparing for a new information system modification of an existing system is stakeholder identification and surfacing (SIAS). A stakeholder is any person, group, or organization affected by the proposed system or system changes. SIAS prepares you to manage people, groups, or other stakeholders in the organization.

When conducting a SIAS, you need to first identify all stakeholders, their feelings about the proposed change, and the power they have to influence the outcome. For example, order entry clerks currently manually enter the orders as they come in from the sales representatives. Their current duties will be eliminated when the new system comes online, and they are worried that they will be let go. As a result, they do not support the new system. As follows in table 3

<u>Stakeholder</u>
a) order entry clerks
B)office manager
c) sales representative
d) sales manager
e)production manager

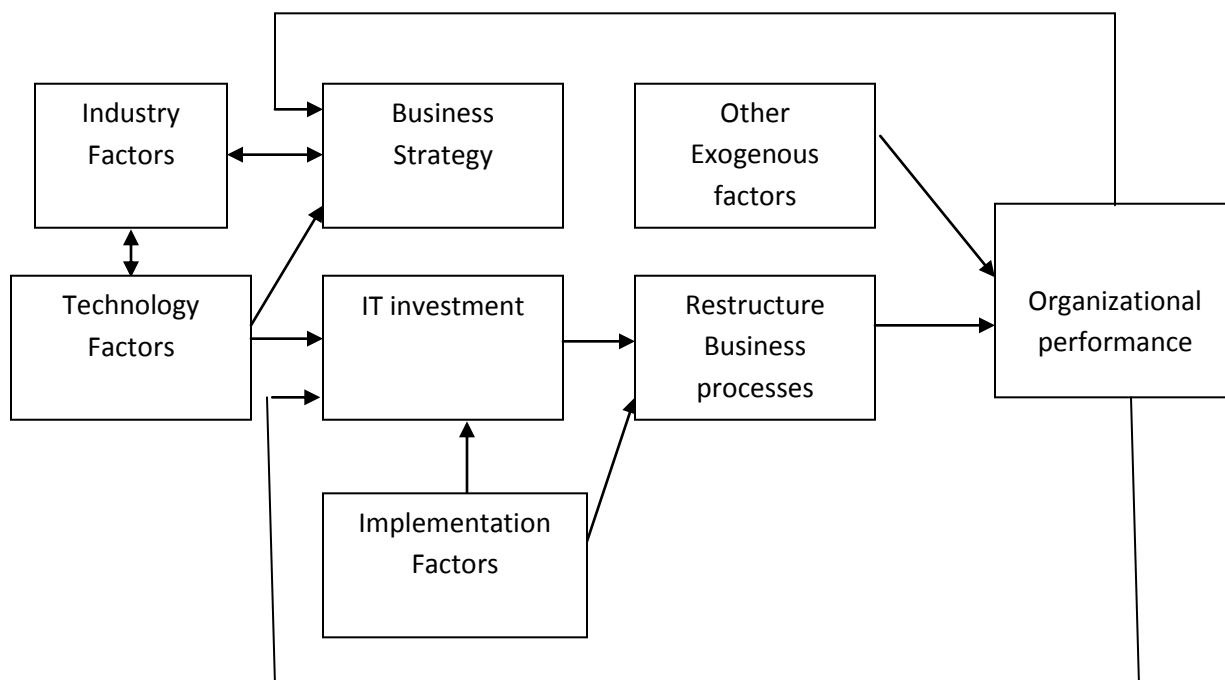
f)accounting manager
g)customers
h)systems programmers
i)chief executive officer
J) chief operating officer

Making the business case for a system

Making the business case is an important for proposed systems as it is for existing systems for a proposed system, the case will be used to determine whether the new system is “go” or a “no go”. For existing system, the case determines whether the company should continue to fund the system.

Making a successful business case

While making the business case for information systems is difficult. In most organizations today, the need to make the case is stronger than ever. Some tips for making the business case can help. There are several factors to take into account when making the business case for a new or existing system, including industry factors, business strategy, and implementation factors which shown in figure 1



1) Industry Factors

The nature of Figure 1: Factors in IT investment define what types of information systems would be most effective. Furthermore, many different types of industry factors can affect the business value of different systems. A system that may have a very positive impact on a firm in one industry may have little or no impact on a firm in another industry the industry factors include:-.

a) Stage of maturity. The stage of maturity for a given industry can have an important influence on IT investment. For example, in a mature and stable industry, such as the automotive industry, IT may be needed simply to maintain the current pace of operations. While having the newest IT available may be nice, it may not be needed to stay in business. However, if one is in a newer, more volatile industry, such as the cellular phone industry, it may be more important to be on the leading edge of technology in order to effectively compete in the marketplace.

b) Regulation. Some industries are more highly regulated than others. In some cases, IT can be used to control processes and ensure compliance with appropriate regulations.

c) Nature of competition or rivalry. Probably the most important industry factor that can affect IT investment is the nature competition or rivalry in the industry. When competition is high, as it is in the personal computer industry, firms need to adopt a strategic.

2) Business Strategy

The particular business strategy of the firm also plays a role in making an appropriate business case for a system. Information systems overview the firm's strategy is its plan of how to compete in the marketplace. IT investments should be closely linked to the business strategy of the firm because these investments are becoming one of the major vehicles by which organizations achieve their strategy and it can be include:-

a) Scale. The scale of the business and its strategy greatly influence which type of information technology is likely to add value to the firm.

Firms operating in a global market place have strong telecommunications requirements and may tend to need systems with significant capacity and processing power. Understanding the scale of operations suggested from the business plan helps you plan for the appropriate technology to meet your needs.

b) Scope. Business strategies also differ in scope. Some firms have a broad scope producing products and services across a wide range of consumer needs while others have a narrower, targeted focus.

c) Strategic potential of IT within the industry. Different forces are at play within different industries. As a result, IT has more or less strategic potential the potential for creating competitive advantage in different industries. The appropriate route to achieving competitive advantage is therefore very dependent on the strategic potential of IT within that industry. For example, firms with a global market have a much stronger need for telecommunications links than small regional firms.

3) Implementation Factors

Besides business industry and strategic factors, other implementation-related factors must be considered when making the business case for systems, including the type of organization its culture, and its political environment and include:-

a) Type of organization. Organizations differ in many different ways. Understanding the type of organization is a critical component of making a good business case for a particular technology. Some organizations are naturally conservative. Usually, conservative organizations want to make sure that a given technology is proven before implementing it

b) Political Factors. Political agendas are an important factor in making a business case for the system. “Managing Information Systems as an Organizational Resource,” power is not equal within organizations. Some individuals or departments have more power than others. Systems that impact the power structure will likely be controversial.

Organizing the information systems function

In many firms today, IS functions are pushed into each of the other functional areas of the firm. In any event, technology use is important and must be managed well one way or another, in a centralized fashion, a decentralized fashion, or in some hybrid of both.

1) A Centralized IS Structure

Figure1 shows a very traditional, relatively simple structure for the IS department, in which IS is centralized within the firm. In this case, the IS director is the head of the department, is a mid-level manager, and would most likely report to a higher-level manager or possibly the executive in charge of the accounting and finance arm of the firm. The IS department is primarily in the business of building and maintaining information systems for people in other functional areas of the firm. If this department were large, there would be separate managers for systems development and maintenance and for operations.

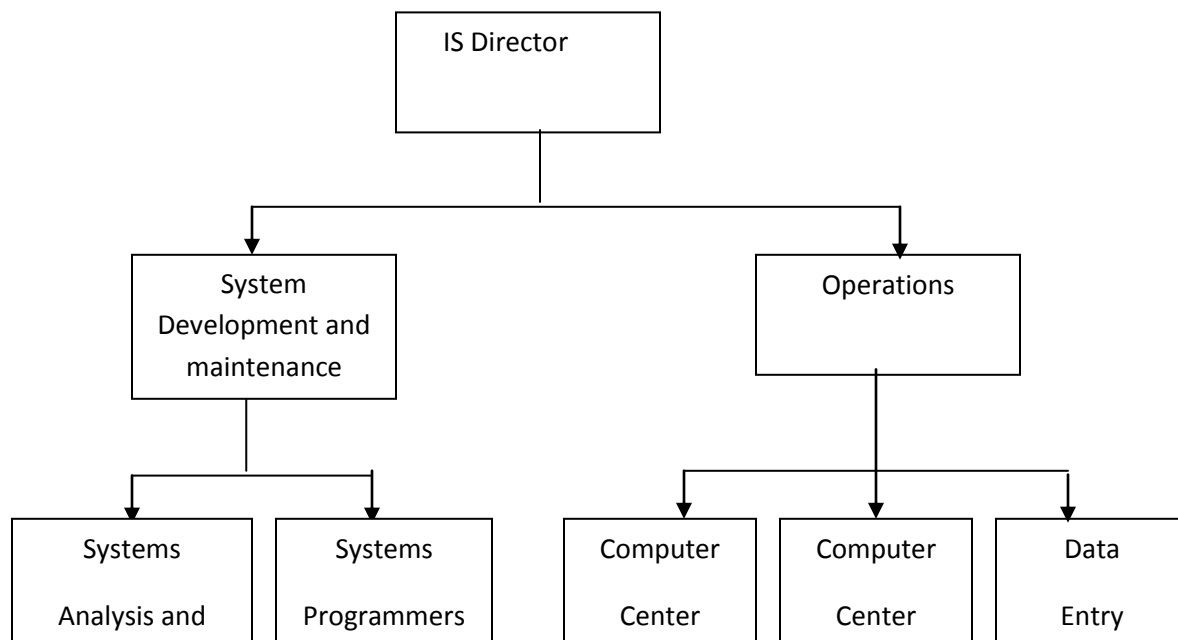


Figure 1: A traditional, simple structure

In Figure 2, we show a typical structure for a modern IS function within a firm where IS, is relatively centralized. In this case, the CIO (Chief Information Officer), the highest-ranking IS employee, performs duties that are strategic and long-term in nature and reports directly to the CEO (Chief Executive Officer). The IS director performs much of the day-to-day management of the IS function.

2) A Decentralized IS Structure

Figure 3, shows a typical structure for a modern IS function within a firm where IS is relatively decentralized. Decentralization is more concerned with providing useful services to people throughout the firm who are deploying their own technologies by themselves; in managing the corporate network; in systems integration; in planning for systems growth, use, and change; and in helping to coordinate technology use across the firm's functional areas than IS unit. Such a unit may not even have any serious hardware (for example mainframe or minicomputer).

Figure 3 depicts a manufacturing organization in which systems use is spread throughout many different functional areas of the firm: production and operations, finance and accounting, and marketing. These functional areas are shown at the bottom of the diagram with the subunits within the IS functions. This same model is also used for large firms with multiple divisions, for conglomerates with multiple companies, and for firms with a product-based or geographically based organizational structure.

A Hybrid IS Structure at Nortel

In many companies, the IS function is organized in a hybrid structure, which is a mixture of centralization and decentralization; such as a manufacturer of telecommunications equipment, is a prime example of such a hybrid approach.

IS Personnel

In large organizations, no matter what type of organizational or IS structure is used, many different management positions are typically within the IS function. In Table 1. we describe several such positions. This list is not exhaustive; rather, it is intended to provide a sampling of IS management positions.

Table 1: Some IS management job titles and brief job descriptions

Job Title	Job Description
CIO	Highest-ranking IS manager. Responsible for strategic planning and IS use throughout the firm.
IS director	Responsible for managing all systems throughout the firm and the day-to-day operations of the entire IS unit.
Account executive	Responsible for managing the day-to-day operations of all aspects of IS within one particular division, plant, functional business area, or product unit.
Information center manager	Responsible for managing IS services such as help desks, hot lines, training, consulting, and so on.
Development manager	Responsible for coordinating and managing all new systems projects.
Project manager	Responsible for a particular new systems project
Maintenance manager	Responsible for coordinating and managing all systems maintenance projects.
Systems manager	Responsible for managing a particular existing system.
IS planning manager	Responsible for developing an enterprise-wide hardware, software, and networking architecture and for planning for systems growth and change.
Operations manager	Responsible for supervising the day-to-day operations of the data and/or computer center.
Programming manager	Responsible for coordinating all applications programming efforts.

Systems programming manager	Responsible for coordinating support for maintenance of all systems software (for example, operating systems, utilities, programming languages, and so on).
Telecommunications manager	Responsible for coordinating and managing the entire voice and data network.
Network manager	Responsible for managing one piece of the enterprise-wide network.
Database administrator	Responsible for managing database and database management software use.
Auditing or computer security manager	Responsible for managing ethical and legal use of information systems within the firm.

Table 2: summary of centralized, decentralized, and hybrid characteristic

	Centralized	Decentralized	Hybrid
Organizational Goal	Internal efficiency. Technical specialization, and quality	External effectiveness, adaptation, client satisfaction	External effectiveness and adaptation, plus internal efficiency
Operational goal	emphasis on functional areas, including IS functional area	Emphasis on various business units	Emphasis on various business units, with some emphasis on the IS functional area
Planning and budgeting	Cost basis	Profit center basis	Varies
IS authority	IS managers	Unit managers	Shared between unit and IS managers
	1) Economics of scale	1) Suited to fast change in unstable environment	1) Organization can achieve adaptability and coordination in some areas and efficiency and

Strengths	<p>2) In-depth technical specialization development</p> <p>3) Easier to coordinate, integrate, and standardize across units</p>	<p>2) Client satisfaction because system responsibility and contact points are clear</p> <p>3) Units adapt to differences in their areas</p> <p>4) Useful in large, complex, distributed organizations</p>	<p>economies of scale in others</p> <p>2) Better alignment between corporate level and unit-level goals</p>
Weaknesses	<p>1) Slow response time to environmental changes</p> <p>2) Decisions and workload may pile up, overload</p>	<p>1) Lose economies of scale</p> <p>2) Poor coordination, integration, and standardization across units</p> <p>3) Lose in depth technical</p>	<p>1) Potential for excessive administrative overhead</p> <p>2) Potential conflict between IS corporate technology goals and unit goals</p>

	3)less innovation 4) Restricted view of organizational goals.	competence and specification	
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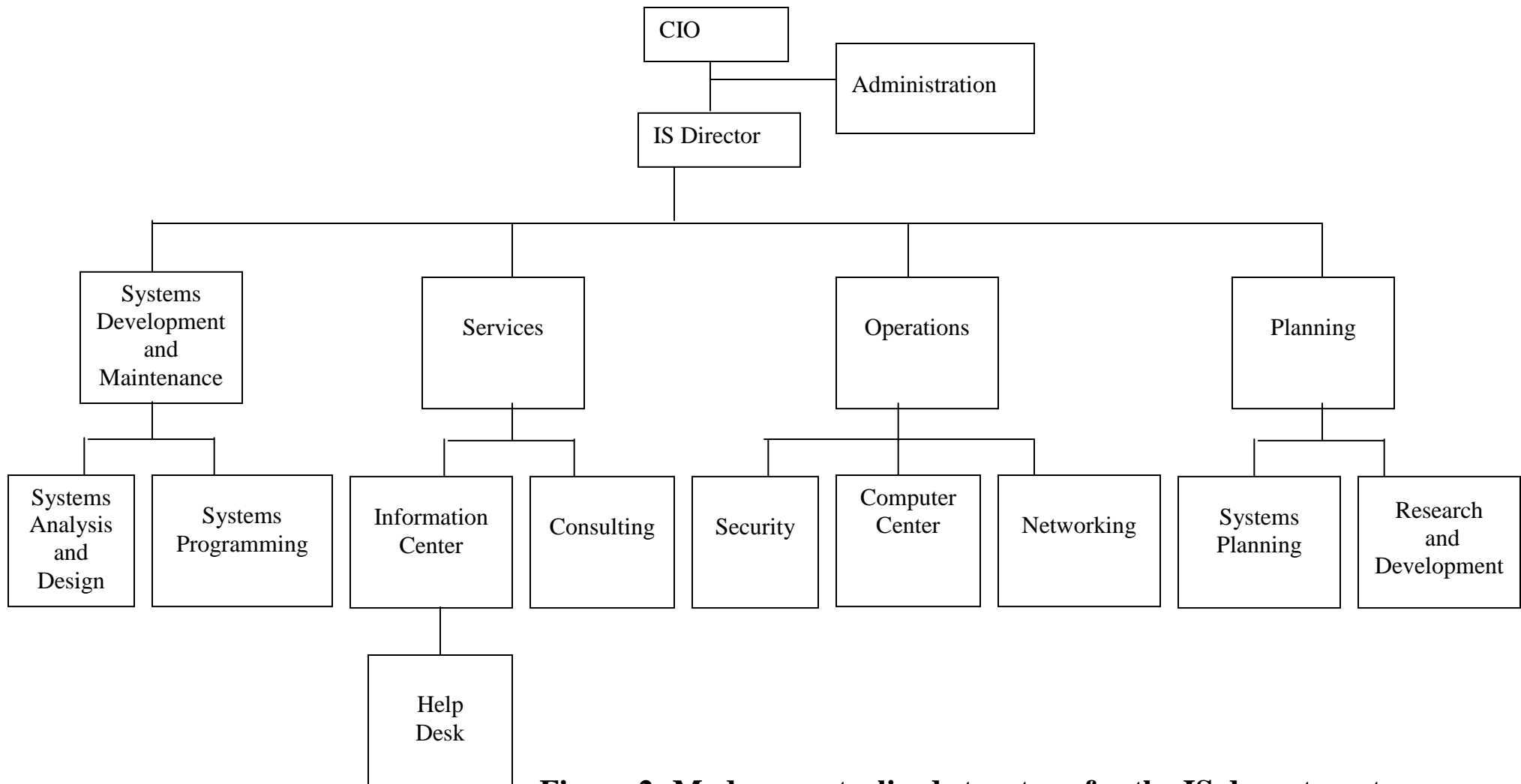


Figure 2: Modern centralized structure for the IS department

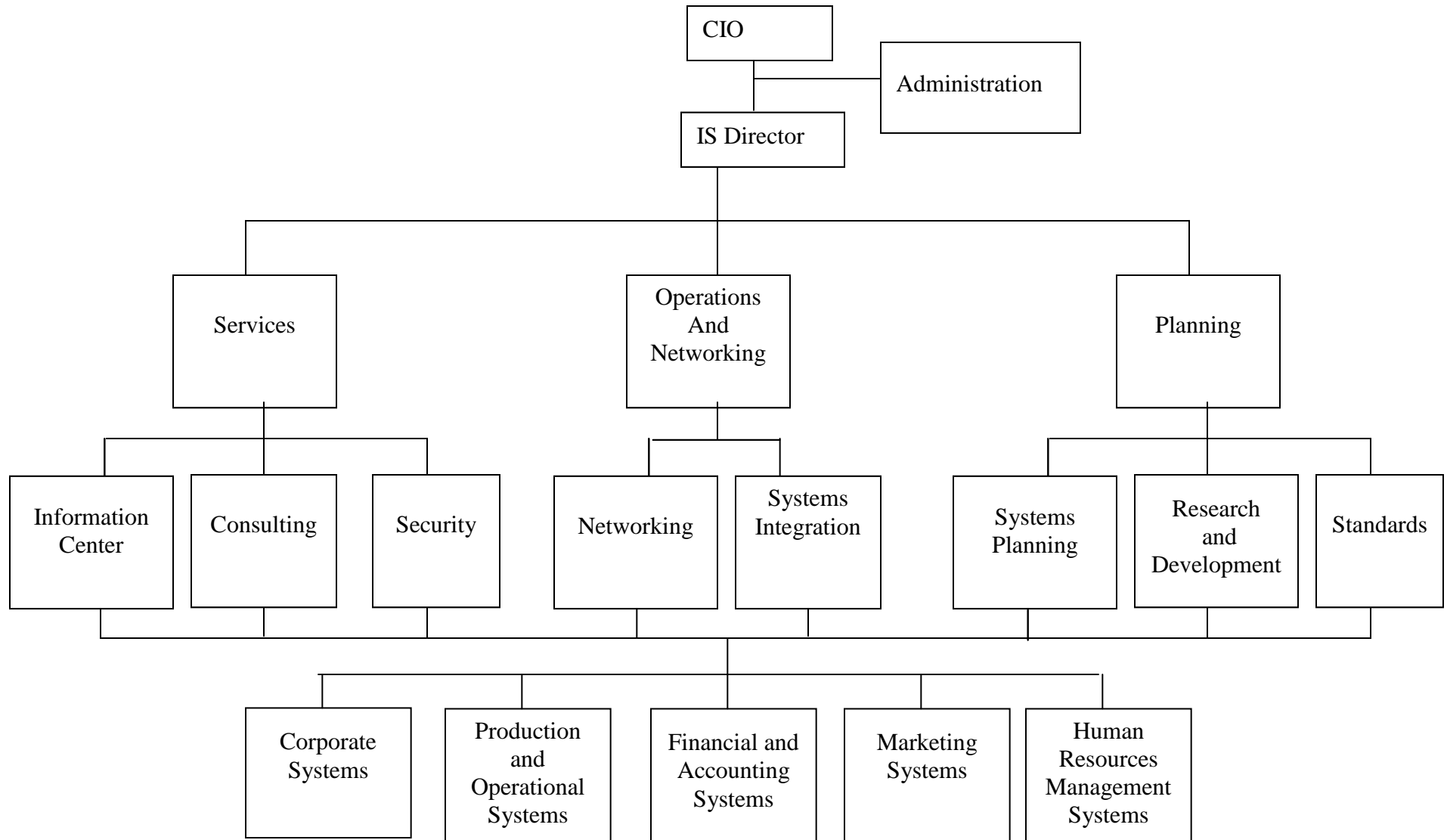


Figure 3: Modern decentralized structure for the IS department