

Having created the Tables and having entered the data as shown in Table 1 and Table 2, the above mentioned basic operators, viz., SELECT, PROJECT and JOIN may be used.

Example:

1. SELECT DEPTT = 'IT'

FROM the table Teacher, we get Table 3

Table 3

TCODE	NAME	DEPTT	DESIG	PHONE
06	S.C. Sharma	IT	Reader	219834
30	P. Gupta	IT	Professor	230956

2. PROJECT CNO, STDNO.

FROM the table Course, we get Table 4

Table 4

CNO	STDNO
CS101	25
CS201	25
CS304	25
CS406	20
CS303	20

Similarly, two or more than two Tables can be joined over a common field.

Example: Table course and table teacher may be joined together over a common field TCODE to obtain the following result. (Table 5)

Table 5

CNO	CTITLE	CREDITS	STDNO	TCODE	NAME	DEPTT
CS101	MIS	6	25	07	R.Balekar	MGT
CS201	SAD	4	25	15	S.C. Sharma	IT
CS304	Software Engineering	4	25	30	P. Gupta	IT
CS406	Information Technology	3	20	06	Rakesh Kumar	ENGG
CS303	Strategic Systems	4	20	11	Anuj Saxena	MGT

In the above example, the use of three basic operators has been explained. However, it may be noted that SQL does not use the SELECT, PROJECT and JOIN formats at the syntactic level, rather it follows a generic format consisting of three sub-commands as follows.

SELECT Filed list
 FROM List of tables
 WHERE Condition

Example: We want to know the name of course(s) where the number of students are less than 21 from our earlier database stored as relation course (Table 6).

```
SLECT CNO, CTITLE, CREDITS, STDNO
FROM Course
WHERE STDNO < 21
```

This will produce the report as given below.

Table 6

SNO	CTITLE	CREDITS	STDNO
CS406	Information Technology	3	20
CS303	Strategic Systems	4	20

Information from two different tables may be extracted by using dot (.) notation as shown below.

```
SELECT CTITLE, NAME
FROM Course, Teacher
WHERE Course.TCODE = Teacher.TCODE;
```

SQL can also perform many other functions that include sorting (ordering), group functions of averaging, summing, locating maximum and minimum values, counting the numbers in a column etc.

Check Your Progress

1. Choose the appropriate answer:
 - (a) RDBMS stands for:
 - (i) Regional Database Management System
 - (ii) Relational Database Management System
 - (iii) Ratio Database Management System
 - (iv) Relational Database Manager System
 - (b) Which one is not related to the database model?
 - (i) Hierarchical model
 - (ii) Relational model
 - (iii) Object oriented model
 - (iv) File transfer protocol
 - (c) Who invented relational data model?
 - (i) P.F. Codd
 - (ii) C.F. Codd
 - (iii) E.F. Codd
 - (iv) S.F. Codd

Contd...

- (d) SQL stands for:
- (i) Secure Query Language
 - (ii) Structured Query Language
 - (iii) Structured Query Learning
 - (iv) None of the above
- (e) PHP stands for:
- (i) Protocol Hypertext Protocol
 - (ii) Peer Hypertext Protocol
 - (iii) Hypertext Preprocessor
 - (iv) Protocol Hypertext Preprocessor
2. Fill in the blanks:
- (a) A is a collection of data, which is organized in a way that allows for easy data retrieval and manipulation.
- (b) A or database schema is the structure or format of a database, described in a formal language supported by the database management system.
- (c) is the analysis of data objects that are used in a business or other context and the identification of the relationships among these data objects.

3.8 LET US SUM UP

Information is a vital resource for one's existence in modern society. Information means the processed data. Data is plural of the word "datum" which means facts in an isolated form. Although, we use both the term interchangeably but they are different in nature.

To become a quality product an information must have clarity, completeness, precision, accuracy, validity, consistency, reliability, exception-based and last but not the least it should be timely.

The estimation of value of information is a difficult task. In some area, a quantifiable measure may be adopted on the provision of quick information in reduction of uncertainty and generating scientific decision. However, there are intangible or non quantifiable measures also. It is difficult, if not impossible, to analyze the contribution of more effective information to a better decision or to isolate the impact of information on the purchase of customers. It is advisable to consider both quantifiable and non quantifiable measure to know the overall benefit value of the information.

There are internal and external source to collect information like observation, survey, library, research, Government agencies, interview etc.

The manager as an information processor has to do various things with the data and information. It includes: putting information to immediate action, disseminating it to others, storing it for future use and discarding the information. Information has many dimensions like business, technical, economic and behavioral. Each dimension depicts different aspect of the information.

Broadly, we can divide information in two types – source of information generation and type of decision taken by the managers.

3.9 KEYWORDS

Database: A collection of logically related records or files. A database consolidates many records previously stored in separate files so that a common pool of data records serves many applications.

Database Management System (DBMS): A set of computer programs that controls the creation, maintenance, and utilization of the databases of an organization.

Data: Facts or observations about physical phenomena or business transactions. More specifically, data are objective measurements of the attributes (characteristics) of entities such as people, places, things, and events.

Data Model: A conceptual framework that defines the logical relationships among the data elements needed to support a basic business or other process.

Data Modeling: A process where the relationships between data elements are identified and defined to develop data models.

3.10 QUESTIONS FOR DISCUSSION

1. List and describe some of the problems of the traditional file environment.
2. Why is file management important for overall system performance?
3. How would you differentiate between hierarchical and network data models?
4. Describe the concept of data modeling in detail with suitable example.
5. What are the advantages of database approach over traditional database?
6. Describe the various functions of database.

Check Your Progress: Modal Answers

1. (a) Relational database management system
(b) File transfer protocol
(c) E.F. Codd
(d) Structured query language
(e) Hypertext preprocessor
2. (a) Database
(b) Database model
(c) Data modeling

3.11 SUGGESTED READINGS

Bhatnagar, S.C. and K.V. Ramani, *Computers and Information Management*, Prentice Hall of India Private Ltd., New Delhi, 1991.

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Davis, Gordon B. and Margrethe H. Olsen, *Management Information Systems*, McGraw-Hill Book Company, Singapore, 1985.

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Other Readings

Effy Oz, *Management Information Systems*, 5th Edition, Thomson Learni

LESSON

4

INFORMATION SYSTEM COMMUNICATION

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4.0 AIMS AND OBJECTIVES

After studying this lesson, you will be able to:

- Understand communication concepts
- Discuss components of IS communication
- Discuss different types of IS
- Understand Decision-making concepts

4.1 INTRODUCTION: MIS AS A COMMUNICATION PROCESS

MIS is a communication process which enables flow of information to be recorded, stored and retrieved for decisions on planning, operating and controlling. The flow of information is the input. The processed information that assist in Decision-making is the output (Ref. Figure below)

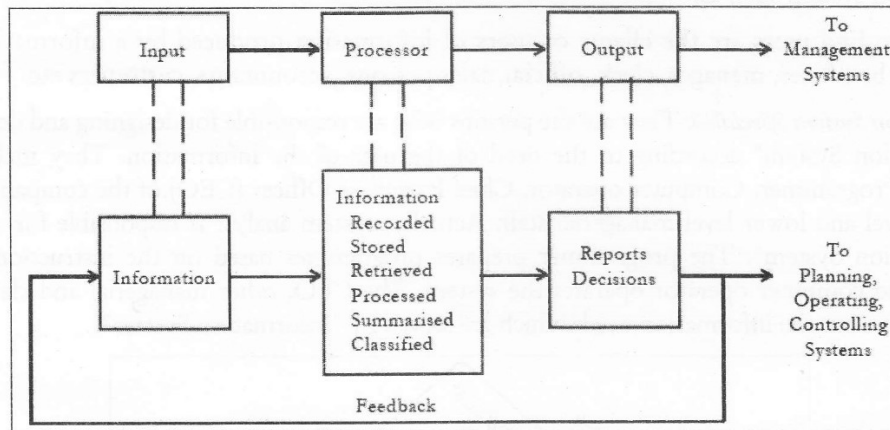


Figure 4.1: MIS Communication Process

While describing MIS as a communication process, it is imperative to dwell upon three key elements of MIS namely timeliness, accuracy and volume of information. The other factor that needs attention is the distinction in the identity of data and information at different levels of management. Delayed information is generally less appropriate for management decisions. It may be contrived or obsolete. The significance of degree of accuracy in an MIS is governed by the purpose of a piece of information. Most management decisions may require approximate and summarized data for analysis. For example, top management generally prefers rounded off figures in mega-units (like Rs. in lacs./crores, quantity in metric ton etc.) to peruse information for strategic plans. The substance of information in the most summarized form is much more appropriate for an MIS rather than the bulk of not too necessary detailed data. If we analyze the general flow of information amongst the various levels and functional area of management, we observe an interesting symbiosis between data and information. For example, a sundry debtors list with outstanding details is definitely important information for an accountant or the operational level management of a finance department in an organization. For the middle or tactical management this information is merely a data. This data may be processed to generate a report on ageing debt analysis or receivables above a specific amount or recoverable/ non-recoverable dues etc. to serve as an information for a middle level management of a finance department in an organization. It is pertinent to note that information for middle management is a data for top management of an organization. Top management may need an information on division wise data in working capital in outstandings as well as

a synopsis of current fixed assets to formulate strategy for business expansion, diversification or laying up policies for streamlining operations of business processes.

4.2 COMPONENTS OF MIS

As we know, every system is made up of various sub-systems. These sub-systems are basically the components of any system. All information system use people, Hardware, Software, Data and network resources to perform input, processing, output, storage and control activities that converts data into useful information. Figure below illustrates an information system model that expresses a fundamental conceptual framework for the major components and activities of information system.

4.2.1 People Resources

To operate an information system successfully, the main resource is people which are of two type in an information system such as:

- **End Users:** End users are the clients or users of information produced by a information system. They can be owner, manager, clerk, official, sales persons, accountants, customers etc.
- **Information System Specialist:** They are the persons who are responsible for designing and developing an "Information System" according to the need of the user of the information. They include system analysts, Programmer, Computer operator, Chief Executive Officer (CEO) of the company and other middle level and lower level managerial staff. Actually, system analyst is responsible for designing of "Information System". The programmer prepares programmes based on the instruction of system analyst and computer operator operates the system. The CEO, other managerial and clerical staff is there to give out the information needs which are served by "Information System".

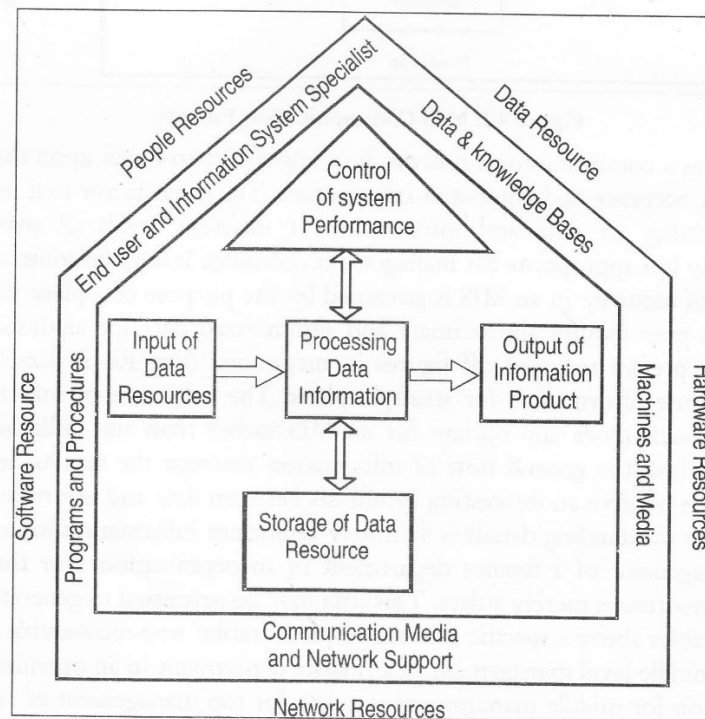


Figure 4.2: Components of MIS

4.2.2 Data Resources

Data is basically, raw fact of an event and business transaction. But in information system, it is more than the raw facts so it is treated as one of the valuable organization resource and it should be managed properly so that a better timely and accurate information is retrieved from "Information System." Data can be of many types numeric, alphabetic and alphanumeric to describe entities and events in business organization. Text data consisting of words, sentences used in written communication, image data such as figures and audio data i.e. the human voice and other sounds. All the data resources are organized into:

1. Data Bases that consist organized and processed data.
2. Knowledge base that consists of rules, regulations, regarding an enterprise.

For example, data about number of students who have enrolled in a university may be accumulated and stored in a student's profile database for subsequent processing that gives detail report of enrolment of students in each course of the university. For university administration, knowledge basis are used for sharing knowledge and giving expert advice on specific subject.

4.2.3 Software Resources

Software resources comprise of the main component of computerized "Information System" as well as manual system. Every "Information System" requires this in the form of information processing instruction and procedures in order to properly capture process and disseminate information to their users. Software resources are basically of three types:

1. *System Software:* Is comprised of the operating system program which control and supports the operation of computer system.
2. *Application software:* This software is a collection of program that actually process data to generate information under various applications. Examples are Payroll program, Accounts package like Tally.
3. *Procedures:* Which are operating instruction for the people who will use an "IS". Examples are instruction to fill out a paper form or using a software package.

4.2.4 Hardware Resources

Hardware resources are the physical and tangible devices. They include not only machines such as computer but also all the data media in which the data is recorded. It will be paper magnetic tape or disk.

Example of Hardware is:

- Computer system may be PC or Micro computer, mini computer or a large mainframe computer.
- Computer peripherals

It includes all input, output and storage device like keyboard, printer and magnetic tape and disk etc.

4.2.5 Network Resources

The concept of network resource emphasizes that all communication network are the fundamental resource component of all "Information System". Telecommunication network like internet have become essential to the successful operations of all type of organization. Network resources consist of:

- Communication media includes Fiber-optic cable, microwave system and communication satellite system.

- Network support includes all of the people, hardware, software, data resources that directly support the operation and use of communication network. Examples include modem and internet, work processors, network operating systems etc.

Also, we identify the components of MIS by describing the system as a processor. Any system is a processor. We would define the system process by identification of our inputs and transformation of our inputs to outputs. The typical example of a system as a processor is data processing system. Here the raw data is processed. The processes include classification, sorting, calculating and summarizing of data. These processes lead to generation of useful information. A computerized MIS processes information. In this case, the processes consist of computation and skilful stylization of management reports. These processes yield paramount decisions for all levels of management for operational, tactical and strategic control as well as planning. The functional relationship between input and output of a process is used to design and evaluate feedback systems.

Process

The total process of a system is the net contribution of many individual processes in the MIS design. This is accomplished by ongoing activities in converting inputs to outputs. For instance, we consider a typical marketing information system. The fundamental inputs and outputs could be perceived as follows:

Inputs

- Sales in units by each salesman for a period (say monthwise).
- Estimated sales in units of competitors corresponding to above.
- Economic conditions and trends.

Outputs

- Sales by product (monthwise and till date).
- Sales by salesman (monthwise and till date).
- Sales by region, salesman and product (monthwise and year till date).
- Sales trend analysis.
- Sales forecasts.

For conversions of outputs from inputs it is imperative to classify, transform, aggregate and analyse input quantities to yield desired output variables. This enables the current information at any specific point of time. It is pertinent to note that the event of competitor's strategies of business promotion ordains for correction in the sales forecast. Similarly emergence of new technologies, re-structuring of sales staff or discovery of new market spaces result in constant variations in sales forecast reports. These quantities which determine the state of the system are called the parameters of MIS. We further note that our marketing information system have two subsystems viz. sales reports and sales forecasts. We identify procedure manuals, telecom and computing devices as common components of our cohesive system. The decision to the extent of manual and computer based system design depends upon the cost constraints and effective implementation of our system. The structure of system is identifiable through the functional relationship among the users and the computing devices.

Boundaries

Any system is identified by certain limiting factors which encompass its components, processes and interrelationships. These limiting factors are termed as boundaries of the system. Effective interfaces

can be built amongst various systems by identification of their boundaries. For example, a teller of accounts in bank is a systems which encompasses activities of withdrawals, deposits and related activities affecting the customer's bank balance. This system excludes other banking activities like mortgage foreclosures, trust activities, loan disbursements, leasing etc. It is interesting to note that an interface is possible by allowing a customer who has a mortgage and also a saving account in the same bank to pay its mortgage premium through the saving accounts automatically. Everything outside the boundary of a system is called its environment. Flows from environment into the system are called inputs. Flows from inside the boundary of a system into environment are called outputs. All elements within the boundary contribute to the specific goals of the system.

Characteristics

There are many characteristics of systems which serve as a checklist for systems designer. The study of these characteristics is imperative to design the feasible management support systems. We enumerate some of the important characteristics to highlight necessity of their scrutiny:

- Integration of processes;
- Accuracy and speed of performance;
- Cost effectiveness;
- Flexibility, reliability and maintainability;
- Ease of operation;
- Acceptability of users and management.

We note that a good system should accommodate all these characteristics. We have already discussed importance of systems approach (Interaction of processes) in designing a good system. We can accomplish the design of good system having above characteristics by use of principles of system analysis and computers.

4.3 CLASSIFICATION OF INFORMATION SYSTEM

Theoretically, there are so many types of information system but broadly there are three categories of information system: Operation support systems, management support systems and other systems. According to this categorization, we can understand the role each plays in operations and management of a business. Figure 4.3. illustrates the classification of information system.

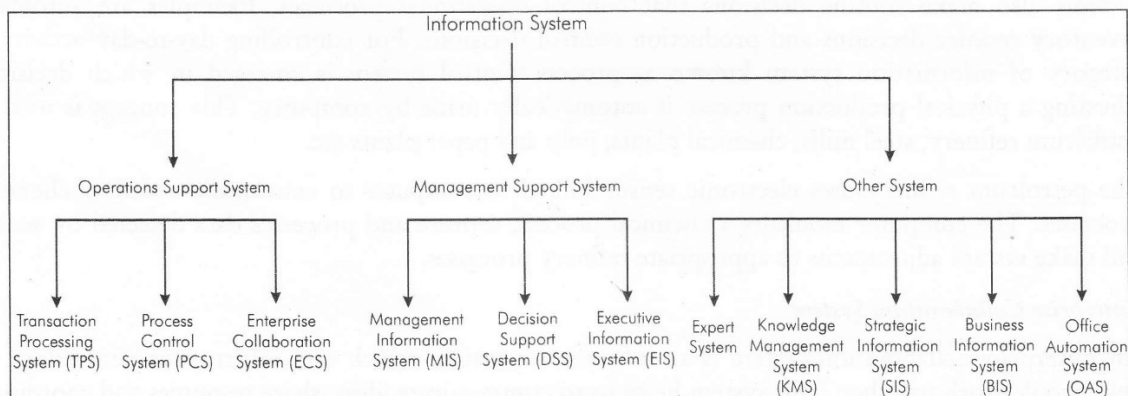


Figure 4.3: Classification of Information System

4.3.1 Operations Support Systems

Every business organization requires information system to process data generated by business organization and used in business operations. Operations support produces a variety of information for internal and external use. The role of a business organization's operations support systems is to efficiently process business transaction, control industrial processes, support enterprise communication and collaboration and update corporate database. The operations support systems are further divided into three basic categories. They represent various role played by them in business organization.

Transaction Processing Systems

Transaction process systems are popularly known as TPS. Transaction processing system is responsible for recording and processing of data resulting from business transaction. For example "Information System" that process sale, purchase, inventory are changes which help in updating the customer, inventory and other organizational database. The product of transaction processing system provides a base or input for Management Information System, Decision Support System and Executive Information System.

TPS also produces a number of information product for internal and external use, for example customer statement, financial statement etc. TPS process transacts in two ways: either batch processing and real time or online processing. TPS is basically meant for lower level of management because it deals with day to day operation of a business organization.

Table 4.1: Characteristics of Transaction Processing System

1.	Transaction processing system is repository of data mainly keeping record of internal and external transactions of a company used by various systems.
2.	Transaction processing in TPS comprises data entry, listing or recording, sorting, merging and updating.
3.	To record transaction, it takes both mode such as batch mode, i.e., the files are updated periodically or in batch and online mode, i.e., each transaction is recorded at the time of its occurrence.
4.	A transaction processing system performs routine and repetitive type of tasks.
5.	It is used by bottom-line managers to support operational decisions.

Process Control Systems

Process control means use of computer to control an ongoing physical process. Process control systems also make routine decisions that control operational processes. Examples are automatic inventory reorder decisions and production control decisions. For controlling day-to-day activity, a category of information system known as process control system is emerged in which decisions adjusting a physical production process is automatically made by computer. This concept is used in petroleum refinery, steel mills, chemical plants, pulp and paper plants etc.

The petroleum refinery uses electronic sensor linked to computer to continually monitor chemical processes. The computer monitors a chemical process, capture and processes data detected by sensor and make instant adjustments to appropriate refinery processes.

Enterprise Collaboration System

An Enterprise collaboration system is an information system which uses information technology to help people work together. This system helps us to communicate ideas, share resources and coordinate our co-operative work efforts as member of many formal and informal process and project teams and

other work group that are a vital part of today's organization. So, the basic purpose of this "Information System" is to increase the productivity and creativity of teams and workgroup in the modern business enterprise by efficiently using the information resources.

To understand the concept of enterprise collaboration system, we can site an example in a manufacturing concern. If the objective is to produce quality goods or create unique product then the marketing strategy will be based on Unique Selling Proposition (USP). Then, the management makes a team which comprises production experts, quality control manager, R & D department and some experts from outside world; basically they are the specialists from a particular field. Such group of persons or team would heavily depend upon the internet, intranet and collaboration software known as "groupware". They communicate with each other or co-ordinate the effort of building quality products with the help of E-mail, video conferencing, audio conferencing, voice mail etc.

4.3.2 Management Support System

Management support systems are there to provide information and support for effective Decision-making by managers. These "Information System" are considered very effective and efficient in an organization because of two facts:

1. One is management orientation of information technology in business.
2. The other emphasizes that a system frame work should be used for organizing information system application.

To serve the information needs at different level of management, we have different types of information systems.

Management Information System

It is the most common and original type of management support system and management Information System. Basically, it serves the information need of operational and tactical level of management which means that it provides detailed and structured information product for the day-to-day Decision-making by the managers. It uses the data generated in transaction processing system as well as data about business environment from external sources. Manager and other user demand information from Management Information System at their network work stations which support their Decision-making. The information may be periodic, exception and demand reports and immediate response to the inquiries.

Table 4.2: Characteristics of Management Information System

1.	Management Information System supports structured and semi-structured decisions at the middle level of management.
2.	Management Information System are useful for planning purposes for senior managers.
3.	Management Information Systems are generally reporting and control oriented.
4.	Management Information System helps in Decision-making using past and present data.
5.	Information requirements are known and only then are stable.
6.	Management Information Systems are relatively inflexible.
7.	Management Information Systems have an internal orientation.
8.	Management Information Systems have little analytical capabilities.

Management information systems are mainly used by middle level managers. They are in between transaction processing systems and decision support systems. So, Management information system has certain differences from Transaction Processing System as well as from Decision support system. Presently, we are going to see the major differences between transaction processing system and management information system in Table 4.3. and DDS and MIS in Table 4.4.

Table 4.3: Comparison of Transaction Processing System and Management Information System

Types of System Points of Comparison	Transaction Processing System	Management Information System
Input	Transaction, Events	Output from TPS, high volume data.
Processing	Data entry, listing, sorting, merging, and updating.	Routine reports, simple models, low level analysis.
Output	Detailed reports, lists, summary of transactions.	Summary and exception reports.
Users	Operations personnel, lower level managers, supervisors.	Middle-level managers.
Goal	Record and process transactions.	Production of summary and exception reports.
Decision and support	Provide decision supports to lower level managers.	Provide decision supports to tactical level manager.

Decision Support System

They comprise of major category of management support systems. They are computer based information systems that provide interactive information support during the Decision-making process. So, in this way, they are different from transaction processing system that process the data generated by business transactions as well as the Management Information System which provide prespecified information that can be used to help them make more effective and structured type of decisions. DSS use analytical models, specialized database, simulation model etc. In DSS, the end user does not specify his need before-hand but he interactively helps them provide information support during Decision-making process by evaluating the various alternatives on the basis of "what IF" analysis. DSS's are initiated and controlled by management end users. They mostly belong to higher level of management. The various characteristics of a DSS are shown in Table 4.4.

Table 4.4: Characteristics of Decision Support System

1.	DSS offers users flexibility, adaptability and a quick response.
2.	DSS are intelligent support systems designed to provide information to top and middle level managers to make decisions that require judgment and intuition.
3.	DSS allows users to generate and control the inputs and outputs.
4.	DSS uses sophisticated analysis and modeling tools.
5.	DSS operates with little or no assistance from professionals such as programmers etc.
6.	DSS provides support for decisions and problems whose solutions cannot be prespecified.

Table 4.5: Comparison of DSS and Management Information System

Points of Comparison	Management Information System	Decision Support System
Input	Output of TPS, high-volume data	Output from TPS and MIS low-volume data
Processing	Extraction and manipulation of business data	Analytical modeling of business Data
Output	Periodic, Exceptions, demand and past reports and responses.	Interactive queries and responses
Information format	Prespecified, fixed format.	Ad hoc, flexible and adaptable format.
Users	Middle-level managers.	Top-level managers, professionals, information workers.
Decision Support	Provide information about the performance of the organization.	Provide decision support techniques to analyze specific problems or opportunities.
Goal	Production of summary and exception reports.	Ad-hoc query handling.

Executive Information System

This "Information System" product serves the strategic information needs of top management and it is basically a "Hybrid Information System" of both Management Information System and DSS. The basic purpose of EIS is to provide top management with immediate and easy access to information about the firms critical success factors, i.e., the key factor responsible for the success of a business organization or in other words achievement of strategic objective of a firm successfully. EIS system present tailor-made information to end user to serve their diverse needs. EIS use the graphical method to represent the things so it stresses the use of graphical user interface. So, EIS's are user-friendly "Information System" that lay emphasis on presentation of summary information and integration of internal and external information.

4.3.3 Other Categories

There are certain "Information Systems" which can be either operation, management or strategic application, some of them are:

Expert System: When we join the concept of artificial intelligence with information system the result is an Expert system. An expert system is the knowledge about a specific area to act as an expert consultant to the user. It is not the replacement of human being rather they help them in using their expertise more efficiently and effectively. The components of an "Expert System" are knowledge bases and software modules which help in giving answer to the various queries. "Expert System" are used in the field of medicine, physical science and business. They support either operation or managerial activities at a particular time. The characteristics of an expert system are shown in Table 4.6.

Table 4.6: Characteristics of Expert System

1.	Expert system is an application of artificial Intelligence which incorporates knowledge and problem solving skills of a human being into an information system.
2.	Expert system can replace human beings.
3.	Expert systems are not designed for one level of management because their primary goal is to provide expertise to whole organization.
4.	Expert system has three components such as knowledge base, the inference engine and the user interface.

Knowledge Management System: In a dynamic business environment some companies become knowledge-creating companies in order to grow and survive. They are indulged in creating new business knowledge, disseminating it within the organization and immediately incorporate them to get new product. These companies combine the knowledge management technique and information technology to encourage employee to give new idea and share their business experiences. So many organization are developing knowledge management system to manage organization learning and business knowhow. Knowledge management help the workers to create, organize and share important business knowhow when it is needed by some worker in the organization.

Strategic Information System: To achieve the strategic objective of a company which may be a competitive edge against its competitor or other strategic objective, the company uses this "Information System". "Strategic Information System" can take a form of TPS, MIS and DSS that help an organizer to gain competitive advantage and reduce or even minimize competitive disadvantages.

Business Information System: The information system which serves the information needs of all functional area of business organization may be finance, marketing, production, research and development and personnel.

Office Automation System: Office automation system are meant for improving the communication and productivity of people in the enterprise. They attempt to automate office procedures and remove bottlenecks, lacuna in the secretarial work. These systems are helpful to all levels of management. The components of office automation system are e-mail, desktop publishing text, processors, graphics and video and audio conferencing.

Finally, Table 4.7 summarizes the various types of information systems with their unique features.

Table 4.7: Summary of Information Systems

Type of System	Input	Process	Output	Users	Examples
Transaction Processing System (TPS)	Transaction, events	Data entry, listing, sorting, merging, updating	Detailed reports, lists, summary of transactions	Lower level managers, supervisors	Sales transactions, Insurance claims
Management Information System (MIS)	Output from TPS, high-volume of data	Routine reports, simple model, low-level analysis	Summary and exception reports	Middle-level managers	Monthly sales report
Decision Support System (DSS)	Output from TPS and MIS, low-level data	Analytical modeling of business data	Interactive queries and responses	Top-level managers, Professionals	Investment portfolios, plant expansion
Executive Information System (EIS)	Aggregate data (external and internal)	Graphics, interactive	Projections, responses to queries	Senior managers	Enterprise - wide performance
Expert System (ES)	Knowledge base, inference engine, user interface	Heuristic searches, fuzzy logic, genetic algorithms, Production system	Analysis reports, expertise to whole organisation	Information workers, professionals	MYCIN, Diagnostic/trouble shooting, decision management, RI
Knowledge Managements System (KMS)	Knowledge base, Data warehouses	Modeling, simulation, Datamining	Create, organize shape, business Knowledge, patterns	Professionals, technical staff	Computer aided design system, knowledge base Decision-making system

Contd...

Strategic Information System (SIS)	External data, data of competitors	Graphics, simulation analyzer software	Interactive, adhoc reporting	Top managers, Information workers	Interactive targeted marketing, Automated just in-time warehousing
Business Information System (BIS)	Financial, marketing, production transactions	Recording, classifying and summarizing transactions, handling queries	Balance sheet, sales report inventory report and soon	Sales Manager, Accountants, marketing managers etc.	Financial information system, marketing information system, production information system
Office Automation System (OAS)	Documents, Schedules	Document, Scheduling, Communication	Documents, Multimedia reports, Mails	Clerical workers	Fax, Video conferencing etc.

4.4 DECISION-MAKING

Decision support systems like MIS have also been defined differently by different people and thus there is no universally accepted definition of DSS. It was in the early 1970s, when Scott Morton put forward the concept to DSS and defined DSS as an interactive computer-based system, which helps decision-makers utilize data and models to solve unstructured problems, and thereafter many other scholars like Little (1970), Alter (1980), Moore and Chang (1980), Keen (1980), etc., have defined the concept in different ways. However, the focus of all these definitions has been on the 'what' aspect, i.e. what a DSS does and 'how' aspect, i.e. how the objective of DSS can be achieved.

Everybody makes decisions. It's a natural part of life, and most of the time we don't even think about the process. In an organization, decisions are made at every level. The level at which the decision is made can also determine the complexity of the decision in relation to the input of data and output of information.

4.4.1 Levels of Decision-making

The levels of decision-making are:

1. **Strategic Decision-making:** These decisions are usually concerned with the major objectives of the organization, such as "Do we need to change the core business we are in?" They also concern policies of the organization, such as "Do we want to support affirmative action?"
2. **Management Control:** These decisions affect the use of resources, such as "Do we need to find a different supplier of packaging materials?" Management-level decisions also determine the performance of the operational units, such as "How much is the bottleneck in Production affecting the overall profit and loss of the organization, and what can we do about it?"
3. **Knowledge-Level Decision-making:** These decisions determine new ideas or improvements to current products or services. A decision made at this level could be "Do we need to find a new chocolate recipe that results in a radically different taste for our candy bar?"
4. **Operational Control:** These decisions determine specific tasks that support decisions made at the strategic or managerial levels. Example: "How many candy bars do we produce today?"

4.4.2 Structured Decisions

Business analysts describe a structured decision as one in which all three components of a decision—the data, process, and evaluation are determined. Since structured decisions are made on a regular basis in business environments, it makes sense to place a comparatively rigid framework around the decision and the people making it.

Structured decision support systems may simply use a checklist or form to ensure that all necessary data is collected and that the Decision-making process is not skewed by the absence of necessary data. If the choice is also to support the procedural or process component of the decision, then it is quite possible to develop a program either as part of the checklist or form. In fact, it is also possible and desirable to develop computer programs that collect and combine the data, thus giving the process a high degree of consistency or structure. When there is a desire to make a decision more structured, the support system for that decision is designed to ensure consistency. Many firms that hire individuals without a great deal of experience provide them with detailed guidelines on their Decision-making activities and support them by giving them little flexibility. One interesting consequence of making a decision more structured is that the liability for inappropriate decisions is shifted from individual decision makers to the larger company or organization.

4.4.3 Unstructured Decisions

At the other end of the continuum are unstructured decisions. While these decisions have the same components as structured ones data, process, and evaluation there is little agreement on their nature. With unstructured decisions,

Example: Each decision maker may use different data and processes to reach a conclusion. In addition, because of the nature of the decision there may only a limited number of people within the organization that are even qualified to evaluate the decision. Another approach is to monitor and document the process that was used so that the decision maker(s) can readily review what has already been examined and concluded. An even more novel approach used to support these decisions is to provide environments that are specially designed to give these decision makers an atmosphere that is conducive to their particular tastes. The key to support unstructured decisions is to understand the role that individuals experience or expertise plays in the decision and to allow for individual approaches.

4.4.4 Structured versus Unstructured

Some decisions are very structured while others are very unstructured. You may wake up in the morning and make the structured, routine decision to get out of bed. Then you have to make the unstructured decision of what clothes to wear that day (for some of us this may be a very routine decision!). Structured decisions involve definite procedures and are not necessarily very complex. The more unstructured a decision becomes, the more complex it becomes.

4.4.5 Types of Decisions and Systems

Information systems support different decisions at different organization levels.

One size does not fit all when it comes to pairing the types of systems to the types of decisions. Every level of the organization makes different types of decisions, so the system used should fit the organizational level, as shown in the Figure 4.4.

It's easy to develop an information system to support structured decision-making. Do you increase production on the day shift or hold it to the swing shift; do you purchase another piece of equipment or repair the old one? What hasn't been so easy to develop is a system that supports the unstructured decision-making that takes place in the upper echelons of a company. Do we expand into foreign markets or stay within the confines of our own country; do we build a new plant in Arizona or Alabama; do we stop production of a long-time product due to falling demand or boost our marketing? The ability to create information systems to support the latter decisions is long overdue.

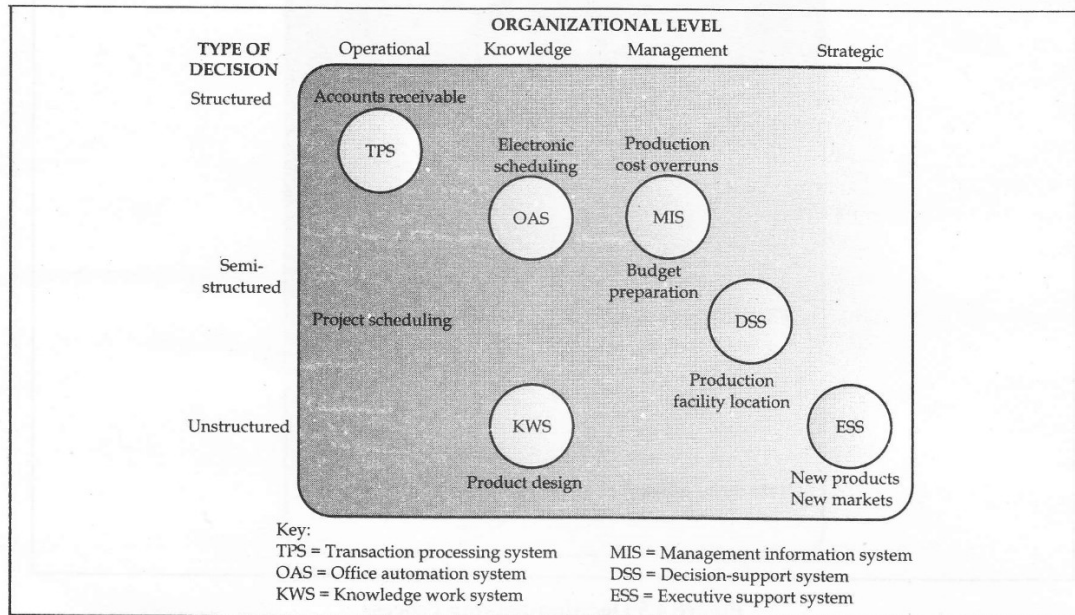


Figure 4.4

4.4.6 Stages of Decision-making

Some people seem to make sudden or impulsive decisions. Other people seem to make very slow, deliberate decisions. But regardless of appearances, the decision-making process follows the same stages of development and implementation. Let's use the example of purchasing a new television, using the Figure 4.5.

1. **Intelligence:** You identify the facts: You don't have a television or the one that you do have isn't any good. You intuitively understand what the problem is and the effect it's having on you. You missed your favorite show last night.
2. **Design:** You design possible solutions: You could watch the television in your neighbor's apartment or you could purchase a new one for yourself. Your neighbor will get annoyed if you keep coming over. On the other hand, you won't be able to go on vacation if you use your money to buy a new television.
3. **Choice:** You gather data that helps you make a better decision: Your neighbor doesn't like the same shows you like or she's getting rather tired of you being there. You also determine that televisions cost a lot of money so you figure out how you can afford one. You choose to purchase a new television instead of watching your neighbor's.

4. **Implementation:** You implement the decision: You stop at the appliance store on your way home from work and carry out your decision to purchase a new television.
5. **Feedback:** You gather feedback: You're broke but you can watch anything you want!

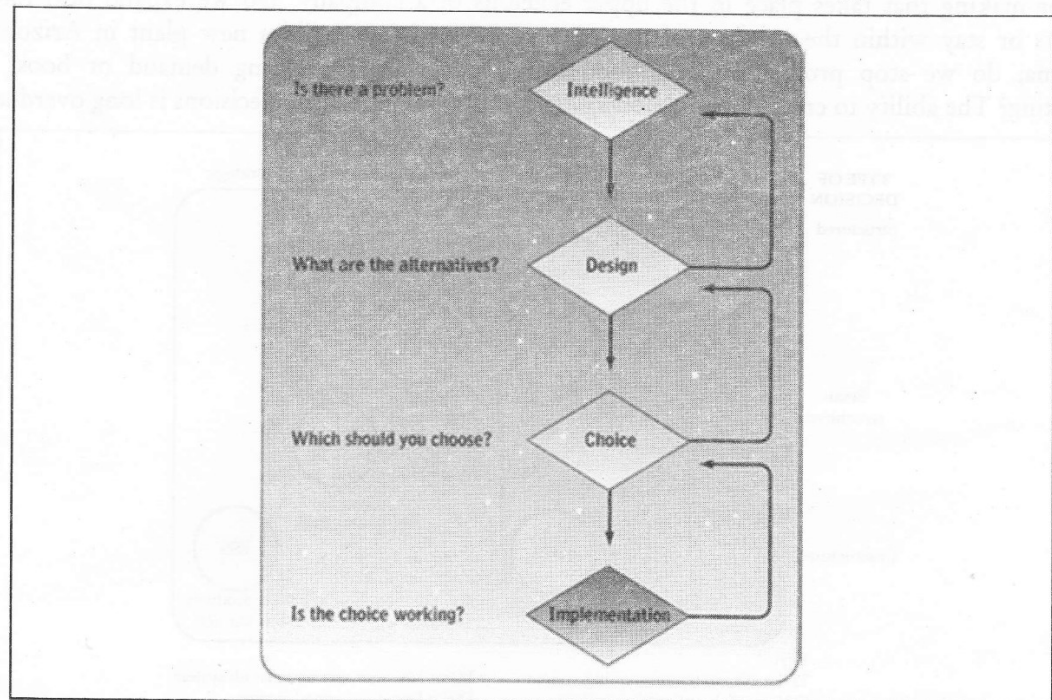


Figure 4.5 Decision-making Process

Of course this is a simplified example of the decision-making process. But the same process is used for almost every decision made by almost every person.

Information Systems help improve the decision-making process by:

- Providing more information about the problem
- Presenting a greater variety of possible alternatives
- Showing consequences and effects of choices
- Measuring the outcome of different possible solutions
- Providing feedback on the decision that is made

Different types of decisions require different types of systems. All decisions follow the same pattern although some may be more complex and require several iterations of the decision-making stages.

4.4.7 Individual Models of Decision-making

No matter how much you know, you can't possibly know everything. No one can possibly know all the input to a decision, process all the possible outcomes, and know every output from the final decision. Neither can an Information System. However, it can gather more input, process it faster, and output more alternatives than a human can.

What a machine can't do is make decisions in context. That could be a positive aspect or a drawback. Humans make decisions based on experience and in very distinct ways based on their frame of reference. For instance, some people won't buy a certain type of television because they haven't had "good luck" with that brand before. Based on their experience, they choose a different alternative than another person would. Some people will do careful, extensive research into all the possible models of televisions and make a decision based on that data. Some people will purchase the same brand as the one they already have. Others simply walk into the store and point to the model they want.

Rational Model

The rational model of human behavior says that people will evaluate the situation and determine what they want the result to be. They will determine the alternative courses of action, know the consequences of each course, and then pick the course with the biggest payoff. If it were only that easy! Think about some of the decisions you've made recently. Did you have an absolutely clear understanding of the situation and know exactly what you wanted the end result to be? Probably not if you did not evaluate the decision closely and thoroughly. Did you examine every possible solution? Probably not. Did you fully comprehend the consequences of every possible solution? Not likely. Was there only one possible outcome to your decision or were there several?

Bounded Rationality and Satisficing

Sometimes people will follow the rational model to a certain extent, with a lot of compromising throughout the decision-making process, by using bounded rationality. That is, they will look at several alternatives, briefly evaluate the consequences of the alternatives, and then pick the solution that will get them closest to where they want to be (satisficing). If they've experienced a similar situation, they'll probably go with the decision most like the previous decision.

Muddling Through

Compromise is a very common occurrence in decision-making. Your club needs to raise dues to pay for a new piece of equipment. Some of your members don't want to purchase the equipment and others want the best brand on the market. A spirited discussion takes place with each side presenting conflicting opinions. After a while, you agree to purchase a used piece costing only half of the original price. You muddled through the decision-making process until everyone agreed on the solution. As it turns out, the decision was similar to one made several years before. By following the previous decision, your group practiced incremental Decision-making.

Psychological Types and Frames of Reference

The cognitive style theory supports the idea that people make decisions based on their experiences and values. Why are there so many different types and styles of automobiles and trucks? After all, isn't the basic idea of owning a vehicle simply a matter of how you get from one location to another? Why do you choose a red car over a blue car? Why do some people own a pickup truck in the heart of a major metropolitan area? Isn't the reason for owning a truck simply to haul things? Major studies have confirmed that people decide the color of their vehicles based on personality type. People choose the type of vehicle, car or truck or minivan, based on their experiences and psychological needs more than for the absolute need for a particular type of transportation.

People are people. Sounds simplified and silly, but it's one of the best explanations for why people make decisions the way they do. This chapter points that some people use a systematic decision-making process,

while others use an intuitive process. You could argue that one method is better than the other, but it's an argument you could carry on forever.

Organizational Models of Decision-making

If it's tough for an individual to make a decision, think how hard it is in an organization with many people all used to making decisions their way! The organizational decision-making process must take into account the various wants and needs of the people who make up that organization. Let's look at various models of organizational decision-making.

Bureaucratic Models

According to the bureaucratic model, the main goal of an organization is the preservation of the organization itself. Change is very slow and difficult because the structure isn't designed for change. Change causes uncertainty, and this type of organization isn't strong on changing anything.

Change is difficult in the bureaucratic organization because most use Standard Operating Procedures to determine how tasks will be accomplished. These SOPs have developed over a long period of time and are usually based on previous decisions and work habits. To some members of the bureaucratic organization, changing the SOPs is to say that the previous methods were inferior or wrong. That's not necessarily the case, since changing environments can bring the need for changing the organization. Nonetheless, changing the bureaucratic organization is a slow and sometimes painful process.

A word of caution: Everyone automatically associates "bureaucratic" with government organizations. Private organizations can be just as interested in preserving their structure. Many private companies could use some drastic changes and improvements, but they don't make them because they are more interested in keeping the status quo.

Political Models of Organizational Choice

The decision-making process in the political model is based not necessarily on what's good for the organization, but on what's good for the players involved. Compromise is more the norm than clear-cut decisions. The goal of this type of organization is to blend the interests of the players into a decision that satisfies as many people or entities as possible.

"Garbage Can" Model

Garbage can model sounds like a funny label, but it's very apt. "Oops" is the operative word in this organization. Too often the people involved in this type of Decision-making process develop the wrong answer to the wrong question. Any success is purely accidental.

Case: Decision-making in Financial Institution

ABC Credit Corporation is a financial institution fully owned by the State Govt. and under the portfolio of State Ministry of Finance. Its mission is to encourage economic development through strategic disbursement of various kinds of loans.

ABC Corporation is divided in to two main divisions-operational & administration. The operational division manages the process for loan arrangements in various situations like agriculture, housing, hire purchase etc.

Corporation has a good support of an MIS for various decision-making activities at strategic, tactic and operational levels:

Contd...

1. **Strategic Level:** For introduction of new services to be offered by the corporation, shift MIS can be useful e.g., introduction of new schemes at lower interest rates can be offered for small business groups.
2. **Management Level:** Evaluation of performance of various types of loan's schemes can be done on the basis of some indicators and this indicator's information can be vital tool for future budget allocation on various future activities.
3. **Operational Level:** All the transactions related to repayments of loans, interests, etc. are managed by MIS and used for customer's enquiries related to current schemes/offers, interest rates, or outstanding balances etc.

MIS can be used to support structured, unstructured and semi-structured decisions e.g., providing complete application, meeting all the requirements for mortgage purpose, and the application where some criteria are met can be referred to the manager to make an informed decision.

MIS is supported by various sub-systems for different functional areas such as: personnel, training & legal issues, asset management, fund management etc., to assist the mainstream activity of recording customers details and repayments of loans and is continuously added and upgraded by MIS.

Questions

1. Outline the different kinds of decisions taken by ABC corporation under the structured, semi-structured and unstructured categories.
2. For the decisions outlined in the previous question, identify the level of management associated with these decisions.
3. Consider a very small Co., where only a few people are decision makers. Explain how different levels of decision-making might be allocated.

Check Your Progress

1. What is Enterprise Collaboration System?
2. What are Unstructured Decisions?
3. What is Rational Model?

4.5 LET US SUM UP

MIS is a communication process which enables flow of information to be recorded, stored and retrieved for decisions on planning, operating and controlling. While describing MIS as a communication process, it is imperative to dwell upon three key elements of MIS namely timeliness, accuracy and volume of information. The other factor that needs attention is the distinction in the identity of data and information at different levels of management. Delayed information is generally less appropriate for management decisions. All information system use people, Hardware, Software, Data and network resources to perform input, processing, output, storage and control activities that converts data into useful information. There are so many types of information system but broadly there are three categories of information system: Operation support systems, management support systems and other systems.

They are computer based information systems that provide interactive information support during the Decision-making process. This lesson focuses on stages, dimensions and optimization techniques for Decision-making. Optimization means achieving the best – maximum or minimum value of the criterion. Sub-optimization occurs either when some criterion subordinates the overall total of all possible alternative actions. A criterion is measured by results which can be evaluated. It measures the effectiveness of the operations under study, in terms of the ultimate objective of the operations, and that may-be net profit, return on investment, cost or some other thing appropriate to a particular study. For achieving optimization, the subject of Operations Research is very useful.

4.6 KEYWORDS

Decision Support System: They comprise of major category of management support systems. They are computer based information systems that provide interactive information support during the Decision-making process.

Strategic Management: Strategic management is that set of managerial decisions and actions that determines the long-run performance of a corporation. It includes environmental observation, strategic planning, formulation, implementation, evaluation and control.

Operating Research: O.R. can be regarded as use of mathematical and quantitative techniques to substantiate the decision being taken. O.R. takes tools from subjects like mathematics, statistics, engineering, economics, psychology etc. and uses them to score the consequences of possible alternative actions.

Linear Programming: Thus 'Linear Programming' indicates the planning of decision variable which are directly proportional, to achieve the 'optimal' result considering the limitations within which the problem is to be solved.

Strategic Decision-making: These decisions are usually concerned with the major objectives of the organization, such as "Do we need to change the core business we are in?"

Knowledge-Level Decision-making: These decisions determine new ideas or improvements to current products or services.

Transaction Processing System: It is repository of data mainly keeping record of internal and external transactions of a company used by various systems.

4.7 QUESTIONS FOR DISCUSSION

1. Discuss various components of MIS.
2. What is Transaction Processing System? Discuss its characteristics.
3. What is Strategic Management?
4. Outline the various levels of Decision-making.
5. Discuss how Decision-making is useful in the financial institution.
6. Discuss different models of Decision-making.

Check Your Progress: Modal Answers

1. An Enterprise collaboration system is an information system which uses information technology to help people work together. This system helps us to communicate ideas, share resources and coordinate our co-operative work efforts as member of many formal and informal process and project teams and other work group that are a vital part of today's organization.
2. The key to support unstructured decisions is to understand the role that individuals experience or expertise plays in the decision and to allow for individual approaches.
3. The rational model of human behavior says that people will evaluate the situation and determine what they want the result to be. They will determine the alternative courses of action, know the consequences of each course, and then pick the course with the biggest payoff.

4.8 SUGGESTED READINGS

G. V. Satya Sekhar, *Management Information Systems*, Excel Books

Ashok Arora & Akshaya Bhatia, *Management Information Systems*, Excel Books