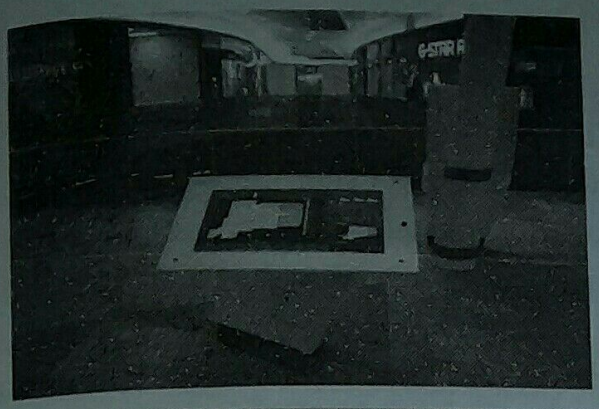


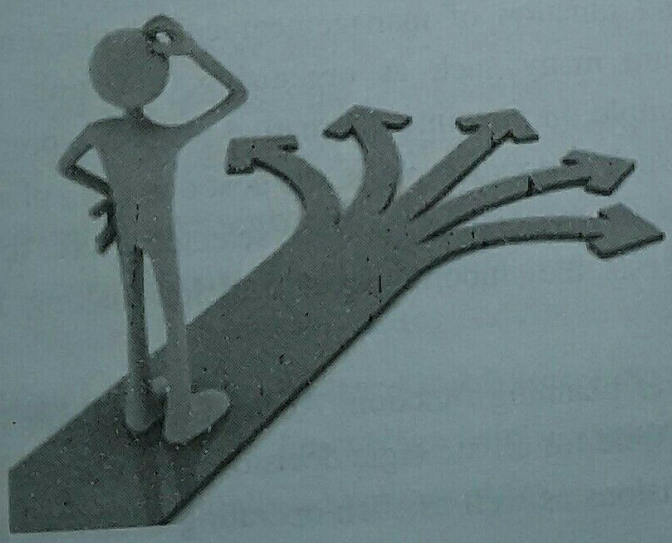
10

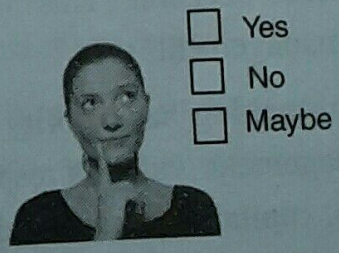
CHAPTER

DECISION MAKING

10.1 INTRODUCTION

Decision making is a daily activity for any human being. All human beings are faced with certain situations in their everyday life, where they need to take important decisions. However, decisions that are made without any planning have a risk of leading to failure. To avoid such problems, it is necessary to take decisions in an organized way. Decision making is usually defined as the act of making up your mind about something. In the decision making process, we choose one course of action from a few possible alternatives. In the process of decision making, we may use many tools, techniques and perceptions. In addition, we may make our own private decisions or may prefer a collective decision. However, the process of decision making is not as easy as it sounds. There are certain important decisions that you have to make which can change the course of your life. Even at a workplace, one is confronted with problems or dilemmas, where the solutions should cater to the need of others around you. Such decisions have to be made in a careful way, especially if it is going to affect you monetarily, or if it is going to bring major changes in your life. Thus, it is important to take decisions in a systematic way, so that the decision you make has high chances of being successful.





10.2 CONCEPT OF DECISION MAKING

Decision-making is an essential aspect of modern management. It is the process of making choices by setting goals, gathering information, and assessing alternative occupations. It is a primary function of management. A manager's major job is sound/rational decision-making. He takes hundreds of decisions consciously and subconsciously. Decision-making is the key part of manager's activities. Decisions are important as they determine both managerial and organizational actions. A decision may be defined as "a course of action which is consciously chosen from among a set of alternatives to achieve a desired result." It represents a well-balanced judgment and a commitment to action. It is rightly said that the first important function of management is to take decisions on problems and situations. It is a continuous process. Decision-making is an indispensable component of the management process itself.

Means and ends are linked together through decision-making. To decide means to come to some definite conclusion for follow-up action. Decision is a choice from among a set of alternatives. The word '*decision*' is derived from the Latin words de '*ciso*' which means 'a cutting away or a cutting off or in a practical sense' to come to a conclusion. Decisions are made to achieve goals through suitable follow-up actions. Decision-making is a process by which a decision (course of action) is taken. Decision-making lies embedded in the process of management.

According to **Peter Drucker**, "Whatever a manager does, he does through decision-making". A manager has to take a decision before acting or before preparing a plan for execution. Moreover, his ability is very often judged by the quality of decisions he takes. Thus, management is always a decision-making process. This is because action is not possible unless a firm decision is taken about a business problem or situation.

The effectiveness of management depends on the quality of decision-making. In this sense, management is rightly described as decision-making process. According to R. C. Davis, "management is a decision-making process." Decision-making is an intellectual process which involves selection of one course of action out of many alternatives. Decision-making will be followed by second function of management called planning. The other elements which follow planning are many such as organising, directing, coordinating, controlling and motivating. For example, in planning alternative plans are prepared to meet different possible situations. Out of such alternative plans, the best one (i.e., plan which most appropriate under the available business environment) is to be selected. Here, the planner has to take correct decision. This suggests the importance of decision-making in the whole process of management.

Decision-making has priority over planning function. According to Peter Drucker, it is the top management which is responsible for all strategic decisions such as the objectives of the business, capital expenditure decisions as well as such operating decisions as training of

manpower and so on. Without such decisions, no action can take place and naturally the resources would remain idle and unproductive. The managerial decisions should be correct to the maximum extent possible. For this, scientific decision-making is essential.

A few definitions of decision making is as under

(a) The Oxford Dictionary defines the term decision-making as "the action of carrying out or carrying into effect".

(b) According to Trewatha & Newport, "Decision-making involves the selection of a course of action from among two or more possible alternatives in order to arrive at a solution for a given problem".

10.3 CHARACTERISTICS OF DECISION MAKING

(a) Decision making implies choice: Decision making is choosing from among two or more alternative courses of action. Thus, it is the process of selection of one solution out of many available. For any business problem, alternative solutions are available. Managers have to consider these alternatives and select the best one for actual execution. Here, planners/ decision-makers have to consider the business environment available and select the promising alternative plan to deal with the business problem effectively. It is rightly said that "Decision-making is fundamentally choosing between the alternatives". In decision-making, various alternatives are to be considered critically and the best one is to be selected. Here, the available business environment also needs careful consideration. The alternative selected may be correct or may not be correct. This will be decided in the future, as per the results available from the decision already taken. In short, decision-making is fundamentally a process of choosing between the alternatives (two or more) available. Moreover, in the decision-making process, information is collected; alternative solutions are decided and considered critically in order to find out the best solution among the available. Every problem can be solved by different methods. These are the alternatives and a decision-maker has to select one alternative which he considers as most appropriate. This clearly suggests that decision-making is basically/fundamentally choosing between the alternatives. The alternatives may be two or more. Out of such alternatives, the most suitable is to be selected for actual use. The manager needs capacity to select the best alternative. The benefits of correct decision-making will be available only when the best alternative is selected for actual use.

(b) Continuous activity/process: Decision-making is a continuous and dynamic process. It pervades all organizational activity. Managers have to take decisions on various policy and administrative matters. It is a never ending activity in business management.

(c) Mental/intellectual activity: Decision-making is a mental as well as intellectual activity/process and requires knowledge, skills, experience and maturity on the part of decision-maker. It is essentially a human activity.

(d) Based on reliable information/feedback: Good decisions are always based on reliable information. The quality of decision-making at all levels of the Organisation can be improved with the support of an effective and efficient management information system (MIS).

(e) Goal oriented process: Decision-making aims at providing a solution to a given problem/ difficulty before a business enterprise. It is a goal-oriented process and provides solutions to problems faced by a business unit.

(f) Means and not the end: Decision-making is a means for solving a problem or for achieving a target/objective and not the end in itself.

(g) Relates to specific problem: Decision-making is not identical with problem solving but it has its roots in a problem itself.

(h) Time-consuming activity: Decision-making is a time-consuming activity as various aspects need careful consideration before taking final decision. For decision makers, various steps are required to be completed. This makes decision-making a time consuming activity.

(i) Needs effective communication: Decision-taken needs to be communicated to all concerned parties for suitable follow-up actions. Decisions taken will remain on paper if they are not communicated to concerned persons. Following actions will not be possible in the absence of effective communication.

(j) Pervasive process: Decision-making process is all pervasive. This means managers working at all levels have to take decisions on matters within their jurisdiction.

(k) Responsible job: Decision-making is a responsible job as wrong decisions prove to be too costly to the Organization. Decision-makers should be matured, experienced, knowledgeable and rational in their approach. Decision-making need not be treated as routing and casual activity. It is a delicate and responsible job.

10.4 STEPS IN DECISION MAKING PROCESS

Decision-making involves a number of steps which need to be taken in a logical manner. This is treated as a rational or scientific 'decision-making process' which is lengthy and time consuming. Such lengthy process needs to be followed in order to take rational/scientific/ result oriented decisions. Decision-making process prescribes some rules and guidelines as to how a decision should be taken / made. This involves many steps logically arranged. It was Peter Drucker who first strongly advocated the scientific method of decision-making in his world famous book 'The Practice of Management' published in 1955. Drucker recommended the scientific method of decision-making which, according to him, involves the following seven steps.

The figure given below suggests the steps in the decision-making process: -

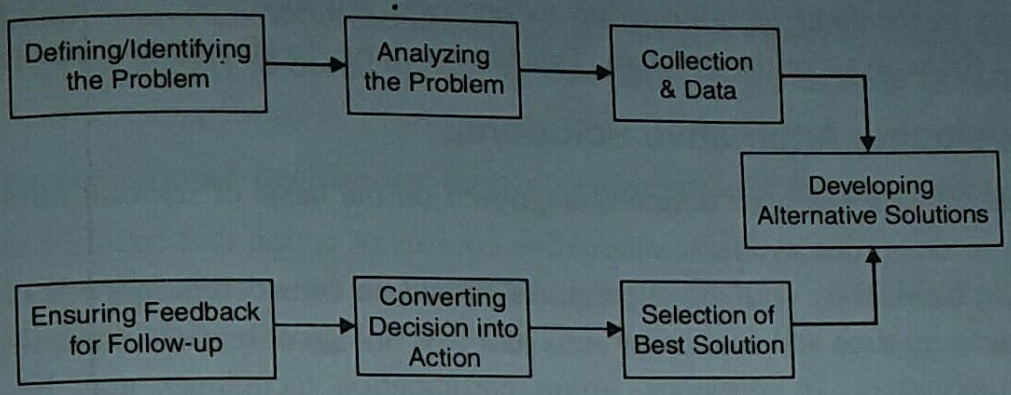


Fig 10.1 Decision making Process

10.4.1 Identifying the Problem:

Identification of the real problem before a business enterprise is the first step in the process of decision-making. It is rightly said that a problem well-defined is a problem half-solved. Information relevant to the problem should be gathered so that critical analysis of the problem is possible. This is how the problem can be diagnosed. Clear distinction should be made between the problem and the symptoms which may cloud the real issue. In brief, the manager should search the 'critical factor' at work. It is the point at which the choice applies. Similarly, while diagnosing the real problem the manager should consider causes and find out whether they are controllable or uncontrollable. There are a couple of questions one should ask when it comes to identifying the purpose of the decision.

- What exactly is the problem?
- Why the problem should be solved?
- Who are the affected parties of the problem?
- Does the problem have a deadline or a specific time-line?

10.4.2 Analyzing the Problem:

After defining the problem, the next step in the decision-making process is to analyze the problem in depth. This is necessary to classify the problem in order to know who must take the decision and who must be informed about the decision taken.

Here, the following four factors should be kept in mind:

(a) Futurity of the decision,
(b) The scope of its impact,
(c) Number of qualitative considerations involved, and
(d) Uniqueness of the decision.

10.4.3 Collecting Relevant Data:

After defining the problem and analyzing its nature, the next step is to obtain the relevant

information/ data about it. There is information flood in the business world due to new developments in the field of information technology. All available information should be utilized fully for analysis of the problem. This brings clarity to all aspects of the problem.

10.4.4 Developing Alternative Solutions:

After the problem has been defined, diagnosed on the basis of relevant information, the manager has to determine available alternative courses of action that could be used to solve the problem at hand. Only realistic alternatives should be considered. It is equally important to take into account time and cost constraints and psychological barriers that will restrict that number of alternatives. If necessary, group participation techniques may be used while developing alternative solutions as depending on one solution is undesirable. For this, one can make use of Cause-and-Effect diagrams and Pareto Chart tool. Cause-and-Effect diagram helps to identify all possible causes of the problem and Pareto chart helps to prioritize and identify the causes with highest effect.

10.4.5 Selecting the Best Solution:

After preparing alternative solutions, the next step in the decision-making process is to select an alternative that seems to be most rational for solving the problem. The alternative thus selected must be communicated to those who are likely to be affected by it. Acceptance of the decision by group members is always desirable and useful for its effective implementation.

10.4.6 Converting Decision into Action:

After the selection of the best decision, the next step is to convert the selected decision into an effective action. Without such action, the decision will remain merely a declaration of good intentions. Here, the manager has to convert 'his decision into 'their decision' through his leadership. For this, the subordinates should be taken in confidence and they should be convinced about the correctness of the decision. Thereafter, the manager has to take follow-up steps for the execution of decision taken.

10.4.7 Ensuring Feedback:

Feedback is the last step in the decision-making process. Here, the manager has to make built-in arrangements to ensure feedback for continuously testing actual developments against the expectations. It is like checking the effectiveness of follow-up measures. Feedback is possible in the form of organized information, reports and personal observations. Feed back is necessary to decide whether the decision already taken should be continued or be modified in the light of changed conditions.

Every step in the decision-making process is important and needs proper consideration by managers. This facilitates accurate decision-making. Even quantitative techniques such as CPM, PERT/OR, linear programming, etc. are useful for accurate decision-making. Decision-

making is important as it facilitates entire management process. Management activities are just not possible without decision-making as it is an integral aspect of management process itself. However, the quality of decision-making should be always superior as faulty/irrational decisions are always dangerous.

For accurate/rational decision-making attention should be given to the following points:

(a) Identification of a wide range of alternative courses of action i.e., decisions. This provides wide choice for the selection of suitable decision for follow-up actions.

(b) A careful consideration of the costs and risks of both positive and negative consequences that could follow from each alternation.

(c) Efforts should be made to search for new information relevant to further evaluation of the alternatives. This is necessary as the quality of decision depends on the quality of information used in the decision-making process.

(d) Re-examination of the positive and negative effects of all known alternatives before making a final selection.

(e) Arrangements should be made for implementing the chosen course of action including contingency plans in the event that various known risks were actually to occur.

(f) Efforts should be made to introduce creativity and rationality in the final decision taken.

Various advantages of decision-making (already explained) are easily 'available when the entire decision-making process is followed properly. Decisions are frequently needed in the management process. However, such decisions should be appropriate, timely and rational. Faulty and hasty decisions are wrong and even dangerous.

10.5 ADVANTAGES OF DECISION MAKING

(a) Decision making is the primary function of management: The functions of management starts only when the top-level management takes strategic decisions. Without decisions, actions will not be possible and the resources will not be put to use. Thus decision-making is the primary function of management.

(b) Decision-making facilitates the entire management process: Decision-making creates proper background for the first management activity called planning. Planning gives concrete shape to broad decisions about business objectives taken by the top-level management. In addition, decision-making is necessary while conducting other management functions such as organising, staffing, coordinating and communicating.

(c) Decision-making is a continuous managerial function: Managers working at all

levels will have to take decisions as regards the functions assigned to them. Continuous decision making is a must in the case of all managers/executives. Follow-up actions are not possible unless decisions are taken.

(d) Decision-making is essential to face new problems and challenges: Decisions are required to be taken regularly as new problems, difficulties and challenges develop before a business enterprise. This may be due to changes in the external environment. New products may come in the market, new competitors may enter the market and government policies may change. All this leads to change in the environment around the business unit. Such change leads to new problems and new decisions are needed.

(e) Decision-making is a delicate and responsible job: Managers have to take quick and correct decisions while discharging their duties. In fact, they are paid for their skill, maturity and capacity of decision-making. Management activities are possible only when suitable decisions are taken. Correct decisions provide opportunities of growth while wrong decisions lead to loss and instability to a business unit.

10.6 SIMON'S MODEL OF DECISION MAKING

Herbert Simon made key contributions to enhance our understanding of the decision-making process. In fact, he pioneered the field of decision support systems. According to (Simon 1960) and his later work with (Newell 1972), decision-making is a process with distinct stages. He suggested for the first time the decision-making model of human beings.

His model of decision-making has three stages:

(a) **Intelligence** which deals with the problem identification and the data collection on the problem.

(b) **Design** which deals with the generation of alternative solutions to the problem at hand.

(c) **Choice** which is selecting the 'best' solution from amongst the alternative solutions using some criterion.

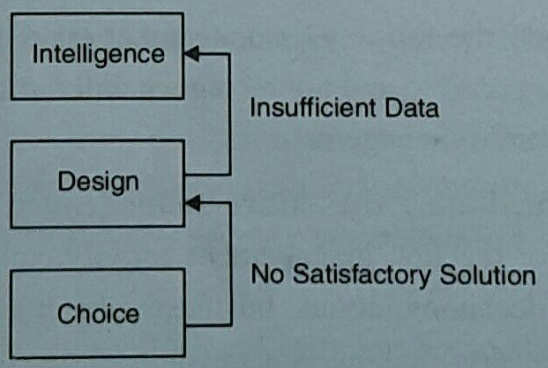


Fig 10.2 Stages of Decision making

10.6.1 Intelligence Phase

This is the first step towards the decision-making process The intelligence phase consists of finding, identifying, and formulating the problem or situation that calls for a decision. This has been called deciding what to decide. The intelligence stage may involve, for example, comparing the current status of a project or process with its plan. The end result of the intelligence phase is a decision statement. A problem in the managerial context is detecting anything that is not according to the plan, rule or standard. An example of problem is the detection of sudden very high attrition for the present month by a HR manager among workers. Opportunity seeking on the other hand is the identification of a promising circumstance that might lead to better results. An example of identification of opportunity is- a marketing manager gets to know that two of his competitors will shut down operations (demand being constant) for some reason in the next three months, this means that he will be able to sell more in the market.

The name of this phase, "intelligence," can be confusing. Intelligence as we usually use the term informally, is talking about decision making, it is what we use after we know a decision must be made. Simon borrowed the term from its military meaning, which involves the gathering of information without necessarily knowing what it will lead to in terms of decisions to be made.

Thus, we see that either in the case of a problem or for the purpose of opportunity seeking the decision-making process is initiated and the first stage is the clear understanding of the stimulus that triggers this process. So if a problem/opportunity triggers this process then the first stage deals with the complete understanding of the problem/opportunity.

Intelligence phase of decision-making process involves:

(a) Problem Searching

(b) Problem Formulation

Problem Searching: For searching the problem, the reality or actual is compared to some standards. Differences are measured & the differences are evaluated to determine whether there is any problem or not.

Problem Formulation: When the problem is identified, there is always a risk of solving the wrong problem. In problem formulation, establishing relations with some problem solved earlier or an analogy proves quite useful.

10.6.2 Design Phase

Design is the process of designing solution outlines for the problem. This phase may involve a great deal of research into the available options. Alternative solutions are designed to solve the same problem. Each alternative solution is evaluated after gathering data about the solution. The evaluation is done on the basic of criteria to identify the positive and negative aspects of each solution. Quantitative tools and models are used to arrive at these

solutions. At this stage the solutions are only outlines of actual solutions and are meant for analysis of their suitability alone. A lot of creativity and innovation is required to design solutions.

10.6.3 Choice Phase

It is the stage in which the possible solutions are compared against one another to find out the most suitable solution. The 'best' solution may be identified using quantitative tools like decision tree analysis or qualitative tools like the six thinking hats technique, force field analysis, etc. This is not as easy as it sounds because each solution presents a scenario and the problem itself may have multiple objectives making the choice process a very difficult one. Also uncertainty about the outcomes and scenarios make the choice of a single solution difficult.

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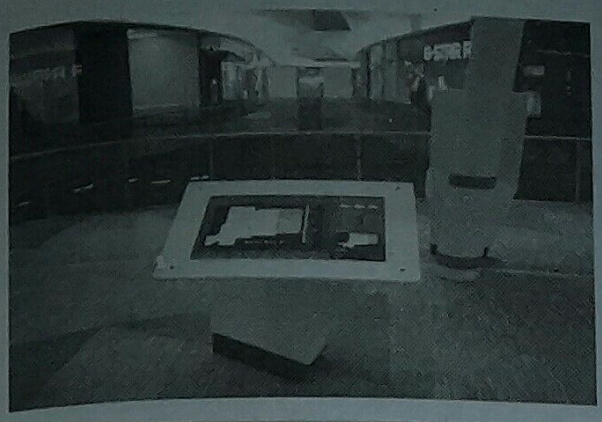

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CHAPTER

DECISION SUPPORT SYSTEM

11.1 INTRODUCTION

- A Decision Support System (DSS) is an information system application that assists in the process of decision-making.
- DSS tends to be used in planning, analyzing alternatives, and trial and error search for solution.
- It is an information system that offers the kind of information that may not be predictable. Business professionals may need such information only once. These systems do not produce regularly scheduled management reports. Instead, they are designed to respond to wide range of requests.
- Decision support systems assist managers, who make decisions that are not highly structured, often called unstructured or semi structured decision.
- The decision support systems support, but do not replace, judgments of managers.
- The main application areas of DSS are Production, finance and marketing.

11.2 COMPONENTS OF DSS

Even though DSS can be of several types, fundamentally each DSS will have the following three components:

- Interactive User-System Dialog Management Subsystem
- Data Management Subsystem
- Model Management Subsystem

11.2.1 Interactive User-System Dialog Management Subsystem

DSS requires continuous user interaction. Sometimes the system should prompt the user to give an input at other time the user should be able to control the processing.

A typical user system dialog management subsystem will have the following elements:

- **User Interface:** The user interface of a DSS has to be dynamic and GUI based. It has to be an easy to use user interface as most of the people who will be using it are not technical experts but management experts (top management) and hence the interface should be simple in design. Also the system should be able to interact with the user in an interactive mode and hence the user interface has to be dynamic.
- **Request Constructor:** Since DSS works on an interactive dynamic mode, it needs a request constructor which can convert the user's instructors into model understandable form, the model's data request to the database and the model's instructions/requests to the user.

11.2.2 Data Management Subsystem

Data is the most important component of a DSS. Without the data, a DSS cannot function. The data management subsystem manages the data for DSS. Data is accessed in many ways hence strong data management subsystems is required to service the varied data requests from a DSS.

The subsystem has the following elements:

- **Database Management System:** It is the data store for the DSS. It manages the data and performs all the functions that a typical DBMS package does. In fact, in most DSS a commercial DBMS or RDBMS package is used to perform this task.
- **The Query Control:** This is a tailored element to handle the query requirements of DSS. It may connect the database, directly to the user interface or to the model base or both.
- **Meta Data**: It contains data about the data that is stored in the database. This helps the DSS in understanding the data in the database properly and helps in creating ad hoc queries.

11.2.3 Model Management Subsystem

This is the unique feature of a DSS. This makes the system special. However, this also makes the system very specific.

The model management subsystem has the following elements:

- **The Model Base Management System:** A model base or rather a model base management system is software is conceptually like what the DBMS is to data which has the capabilities to manage a model for it to be useful to the decision maker. It is the core of a DSS. It supports generation of models and works with data on one hand and the user supplied instructions on the other.

- **The Model Command Processor:** It is the entity that processes the commands coming from the dialog management subsystem.
- **The Model Executor or Solver:** It is the heart of the system. It is the process through which the model is solved using some algorithm. It works with the model as generated by the model base with instructions from the user, the request constructor to get the parameters of the model from the user and data from the data management subsystem. It then solves the problem and displays the results and some variations of the best fit solution through the dialog management subsystem. The alternative solutions as provided help the user in decision-making.

11.3 ATTRIBUTES OF DSS

- Adaptability and flexibility
- High level of Interactivity
- Ease of use
- Efficiency and effectiveness
- Complete control by decision-makers
- Ease of development
- Extendibility
- Support for modeling and analysis
- Support for data access
- Standalone, integrated, and Web-based

11.4 CHARACTERISTICS OF DSS

- Support for decision-makers in semi-structured and unstructured problems.
- Support for managers at various managerial levels, ranging from top executive to line managers.
- Support for individuals and groups. Less structured problems often require the involvement of several individuals from different departments and organization level.
- Support for interdependent or sequential decisions.
- Support for intelligence, design, choice, and implementation phases of decision Making process.
- Support for variety of decision processes and styles.
- DSSs are adaptive over time.

11.5 CLASSIFICATION OF DSS

DSS have been classified in different ways. Some of the well-known classification models are given below:

- According to Donovan and Madnick (1977) DSS can be classified as,
  (a) Institutional-Such type of DSS supports ongoing and recurring decisions
  (b) Ad hoc-Adhoc DSS supports only one kind of decision.
- Hackathorn and Keen (1981) classified DSS as
  (a) Personal DSS
  (b) Group DSS
  (c) Organizational DSS

Alter (1980) opined that decision support systems could be classified into seven types based on their generic nature of operations. He described the seven types as,

(a) File drawer systems: This type of DSS primarily provides access to data stores/data related items.

(b) Data analysis systems: This type of DSS supports the manipulation of data through the use of specific computerized settings or tools.

(c) Analysis information systems: This type of DSS provides access to sets of decision oriented databases and simple small models.

(d) Accounting and financial models: This type of DSS can perform 'what if analysis' and calculate the outcomes of different decision paths.

(e) Representational models: This type of DSS can also perform 'what if analysis' and calculate the outcomes of different decision paths, based on simulated models.

(f) Optimization models: This kind of DSS provides solutions through the use of optimization models which have mathematical solutions.

(g) Suggestion models: This kind of DSS works when the decision to be taken is based on well-structured tasks.

11.5.1 Modern classification of DSS

(a) Model Driven DSS: is a DSS that uses a model for deriving solutions to problems. It has access to the models and has flexibility of changing the parameters of the model. Real data or transactional data from databases of TPS is then passed through the model to arrive at the solution. The system is capable of producing different scenarios.

(b) Data Driven DSS: is a DSS that gives access to time-series internal data. Data ware houses that have tools that provide facility to manipulate such data are examples of advances systems. Executive Information Systems are examples of data-driven DSS.

(c) Communications-driven DSS: is a DSS that uses network and communications technologies to support decision-relevant collaboration and communication. In such systems, communication technologies are the most important component.

(d) Document-driven DSS: is a DSS that uses computer storage and processing to provide document retrieval and analysis.

(e) Knowledge-driven DSS: is a DSS that collects and stores 'expertise' so that it can be used for decision-making when required.

11.6 DIFFERENCE BETWEEN MIS AND DSS

S.No	MIS	DSS
1.	MIS stands for management information system	DSS stands for decision support system
2.	MIS supports the intelligence & implementation stages for decision making	DSS supports the intelligence the design, choice & implementation stages for decision making
3.	MIS provides indirect support to many managers	DSS provide direct support to particular manager
4.	MIS supports structured decisionfor operational & tactical planning & control.	DSS supports semi structured & unstructured decisions for tactical & strategic planning & control.
5.	MIS provide information about the performance for the organization	DSS provide information & decision support techniques to confront specific problem.
6.	It provides only indirect access to data by manager	Managers have direct access to data
7.	Delivers system based on frozen requirements	Follows interactive process hence current data be used

11.7 BENEFITS OF DSS

- Improves efficiency and speed of decision-making activities.
- Increases the control, competitiveness and capability of futuristic decision-making of the organization.
- Facilitates interpersonal communication.
- Encourages learning or training.
- Since it is mostly used in non-programmed decisions, it reveals new approaches and sets up new evidences for an unusual decision.
- Helps automate managerial processes.

11.8 TECHNIQUES USED IN DECISION-MAKING

(a) Simulation: In this approach, a mathematical model of the situation is created. The main decision variables are defined and the model is operated under different assumptions or with different starting conditions to help explore alternative paths for the real situation.

(b) Optimization: In optimization technique, a mathematical model of the situation is developed. The model is designed so that optimization techniques can be used to search for optimal values of decision variables.

(c) OLAP and Data Mining: It uses statistical techniques to analyze business results and find hidden relationships.

(d) Expert Systems: Here an expert's view of an area of knowledge in terms of facts and rules are summarized and then the facts and rules to a particular situation are applied to help someone else decide what to do.

(e) Neural Networks: It starts with a large set of coded examples that represents the range and frequency of possibilities in the situation being studied. Neural networks apply automated statistical 'learning' techniques to find the statistical parameters that best present correlations between groups of characteristics within the trading set.

(f) Fuzzy Logic: In this approach, decision processes are controlled using logic systems that replace 'either - or' logic with logic based on relative degrees of inclusion in sets.

(g) Case-based Reasoning: This approach creates a database of examples that may help in making decision. Add another example to the database when the database does not cover a new situation.

(h) Intelligent Agents: In this technique, decision parameters are specified for a computerized 'agent' that searches one or more databases to find a specific answer, such as the lowest price for a particular mobile set.

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