BLOCK 1 INFORMATION FOR DECISION MAKING

This block gives an insight into the decision-making process, the various kinds of information systems existing and the management of the information resources.

Unit 1 on Decision Making explains the various kinds of managerial decisions and how they are made.

The second unit on Conceptual Foundations of Information Systems helps to appreciate the significance of information systems in an organisation.

The last unit in this block on Information Resources Management relates to the issues concerned with information resource management in the organisations within the available framework.

UNIT 1 - DECISION MAKING

Objectives

After going through this unit, you should be able to

* appreciate the nature and variety of managerial decisions
* develop decision table logic for structured and programmed decisions
* understand the decision making process
* understand the relevance of various models of individual and organisational decision making.
* give examples of how information systems support various stages of decision making.

Structure

1.1 INTRODUCTION TO DECISION MAKING

The field of decision making is vast. There have been many approaches to managerial decision making. These have ranged from the strictly quantitative as typified by the methods of operations research - to those based on human and organisational behaviour. It is only recently that those working in the area of decision making have started to combine approaches that could cater to the multiplicity of subjective and objective factors, and the multiplicity of criteria and objectives - some in conflict with one another.

Decision making is an essential part of management. Some have even suggested that management is synonymous with dicision making. Managers are decision makers and problem solvers. Whether a manager is involved in evaluating new opportunities or eliminating long standing difficulties, decision making for management is essentially problem solving. The process of deciding is intimately related to the whole process of knowing (or 'cognition'). Knowing "what the problem is" will assist in deciding "what to do about it", that is finding the best solution. This is basic for each individual personally and also for a professional manager, whose main orientation is towards the making of decisions. There is always an implicit opportunity loss associated with poor decisions. They are the foregone gains, profits or cost savings, which could have been realised had a better decision been made.

However, the process by which one arrives at a decision is quite complex; infact no one process can be applied to all decisions. Over the decades, decision - making methods have evolved. from primitive to supersophisticated, ranging from the instinctive/intuitive approach, to traditional precedent based approach, to the commonsense approach, to the scientific method. A decision involves many intuitive and deep-seated cognitive mechanisms that cannot be observed fully or directly influenced. What can be influenced are the behaviour patterns, the analytical procedures and the sequence of logic that are followed in making a decision. Ideals, objectives and goals form the background against which decisions are made.

There are many types of decisions, some that are completely specified, some partly specified and many unspecified. . We shall discuss how computers have entered in decision aiding process, who all are the end users of the systems, the different types of decisions, the decision making process and the implications for the information systems analyst. It would be our effort to minimise repetition of concepts or subjects that we have already discussed in previous courses or modules. These, however, are important and should be referred to for better understanding and appreciation.

Let us look at the different types of decisions that are encountered by managers. We would like to categorise them primarily into two categories, structured and unstructured.

1.2 STRUCTURED DECISIONS

These structured decisions are those that can programmed. They are essentially repetitive, routine and involve a definite procedure for handling them so that they do not have to be treated each time as if they were new.

It has been seen that in general at the lowest level in the organisation. viz., the operational level and the managerial staff, deal mostly with such fairly well structured problems. In the past most successful applications of information systems have come in dealing with structured, operational and management control decisions. These fall really in the domain of transaction processing and it is for this reason that some researchers prefer to call such systems as TPS - Transaction Processing Systems, rather than MIS - Management Information Systems.

Thus structured decisions which are also called programmable decisions involve situations where the procedures to follow when a decision is needed can be specified in advance. Therefore, such decisions are structured or programmed by the decision procedures or decision rules developed for them. A structured decision could possibly involve what is known as a deterministic decision or an algorithmic (step by step procedure) decision. In this case, the outcome of a decision can be determined with certainty if a specified sequence of activities, viz., the algorithm is performed. No doubt many decision situations do not all.come under deterministic criteria. There might be probabilistic decision situations. Since, in this case, enough probabilities about possible outcomes are known, a decision can be statistically taken or determined with an acceptable probablity of success.

Herbert A. Simon stresses the programmable part of the structured decisions and accordingly terms 'structured decision' as 'programmed decisions'. In the programmed decisions, a problem (or one very similar) occurs frequently enough so that afixed routine or programme is established for solving it. Programmed decisions are infact those that are made inaccordance with some policy, rule or procedure so that they do not have to be handled de novo each time they occur. Infact these decisions are generally repetitive and routine and are obviously the easiest for managers to make. It is for these reasons that such managerial problems are relegated to the supervisory level. The supervisors fall in the first entry ring of management. It gives persons of this level the slight 'kick' or morale boost as they have entered into the 'management category' No doubt the perceptions will have to change since they have moved across from the worker/operator level to the other side of the table. Decisions implemented by the supervisors might feel elated, but when compared to managers at the higher levels, the supervisory level decisions are pretty straight forward and simple because of their structured nature. These decisions are in fact routine decisions and they require little deliberation from the top man's point of view.

These routine decisions are taken against a familiar background in everyday business operations. Such decisions involve no extraordinary judgement, analysis or authority, since they are to traverse through more or less fixed avenues. On account of the experience gained or because of the trivial nature of the problems on hand, management has already established a set of rules, policies and procedures. With the organisation's goals, policies and processes established, the routine decisions demand, on the part of managers, a power of selection of the best path, as the connecting link between the given means and the established ends.

The structured decisions, often termed as programmed decisions, are labels that are derived from the jargon of the computer field, where a program is defined as a plan for the automatic solution of a problem. Programs are simply a string of instructions to accomplish an assignment. However, it is well known that all problems do not lend themselves to automatic programmed solutions. No doubt an information system analyst might be having his cherished dream of having all decisions in an oraganisation programmed or fully automatic. Then perhaps there would be no dividing line as regards variety of type of skills required by managers at various levels. You would recollect that studies have shown that more technical skills are required at the lower levels whereas more conceptual skills are required by managers at the higher levels, apart from human skills that are requierd at all levels of management.

It has been seen that by far the greatest number of business decisions are repetitive and routine ones. If this is true, then there is an overriding need to automate or program these decisions so that managers and executives could delegate such problems to lower levels and have them made by one or more techniques of programmed decisions. It is interesting to note that in some cases even upto 90% of management decisions are routine ones.

Most programmed decisions are solvable by the 'force of habit'. We go to our offices, make decisions about the in-basket or in-tray correspondence, and take dozens of actions daily that are "programmed" through sheer force of habit. Infact this is gained by 'experience' in an organisation. Whenever there are turnovers, it is this valuable experience that is lost, which could be quite costly. It usually takes time and money for newer *recruits to acquire this experience.*

The 'force of habit' in fact leads to certain traditions, conventions and practices which might become a platform towards formal statement of rules, procedures, policies, etc.

At this stage, it would be worthwhile to spend some time looking at what constitutes a rule, procedure or a policy.

A rule is a specific policy statement about the conduct of certain affairs. For instance, a rule may state that any person who comes in late to work will face disciplinary action. It could be that if an employee is to start his office hours from 9.00 a.m., if he comes by 9.15 a.m., he could be tolerated. Time between 9.15 a.m. to 9.30 a.m could be allowed at best say thrice in a month. Anything beyond these limits would necessitate some disciplinary action. A rule is frequently used when confronting a well structured problem. Rules are usually rigid which might specifically tell about 'do's and don'ts'. Rules are usually framed in a manner to take care of almost all situations. However, we do have instances where the rule applies - 'show me the man I'll show you the rule'. You often hear the term that 'rules are silent on this issue. Indeed rules are quoted again and again depending on what is to be proved or justified or rationalised in order to take the final decision .

Activity A

Could you enumerate the rules followed in your organisation by you in seeking a temporary replacement for three days for an absent typing clerk.

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A **procedure** is a series of steps that are sequential in nature and interrelated to address a well structured problem. A procedure is a kind of direction in using a series of steps in either diagnosing a problem or solving it. For instance, if your car is not working, the mechanic has a manual of procedures to check the trouble and follow procedures to correct it. He might like to first find out whether there is petrol in the tank. If petrol is there, he might like to check the battery terminals to see whether they are loose. With experience it is possible to have shortcuts in diagnosis, which might sometimes appear to be done on a random basis or just on a 'trail and error' basis. Now the company procedure could be written, oral or implied. Standard operating procedures provide a means for indoctrinating and training new personnel and for guiding experienced personnel in the performance of specific tasks. The procedure has the additional advantage of forcing a certain amount of detailed planning, because it cannot be adequately designed, reviewed, or implemented without careful thought.

Activity B

What would be the procedure followed by you to mend a leaking tap in your bathroom?

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As for a policy, it is a general guideline which sets up parameters for the judgment within which to operate and is general and judgemental in nature. For instance, the policy of a company may be 'the customer is always right'. But it is left to the manager to rightfully interpret this policy in a particular situation. It is indeed possible that there could be a bias, even perhaps an emotional outburst and sometimes an immature and unrealistic response of the customer. Should the policy be implemented in true letter and spirit? Should one think of the policy in the long-run or short-run? Now if the case is to be considered under the structured programmed decision category, some definite answers would have to be provided rather than leaving it ambiguous, vague and fuzzy.

1.2.1 Decision Tables for Structured/Programmed Decisions

Let us demonstrate the use of a decision table in the context of a programmed or structured decision. Consider an accounts receivable process in which customers accounts are examined with the purpose of producing a statement and a possible reminder, of variable severity, for each account.

The analyst's first step is to decide upon the set of criteria applicable. By discussing with various relevant groups of people, three unrelated possibilities are discovered (1) that within 30 days the amount exceeds Rs.5.000/- (2) that within 60 days the amount exceeds Rs. 2,000/- and (3) there is still an amount to be paid on goods purchased more than 60 days ago. Let us denote these condition stubs as AR1, AR2, AR3 respectively.

The possible answers to each of these questions is a sample yes (Y) or no (N). Thus there are a maximum of $2^3 = 8$ rules corresponding to the possible combinations of answers. These are placed in the condition entry section of the table, one per decision rule column. There is no significance attached to the order in which the rules are written, provided that all possible entries are recorded. However, it is sometimes possible to combine two or more rules if it is known that the ensuring actions are all identical.

By further questioning, the analyst establishes the complete list of all possible actions and writes them in the action stub, one per line. Suppose that, by the time this section of the system is 'activated' a preliminary operation has bypassed all those customers not needing a statement, and has already produced a statement for those to whom one is due. The only task remaining is to produce one or more of :

* A moderate reminder (Letter A)
* A very severe reminder (Letter B)
* A very Terse Post Script to either letter (the same in each case)
* A special report on the customer for the sales manager (called Exception Report.)

Now the REPORT will no doubt be produced on some unit other than the one which will print the letters and may consequently be produced anywhere in the action sequence.

A terminal action (which leads on to the next operation to be performed) could also be included (i.e., GO TO xxx where xxx is the name of some other decision variable).

Figure 1.1 gives the completed decision table for the programmed decision situation of accounts-receivable.

CONDITION STUB	DECISION RULES							
	1	2	3	4	5	6	7	8
AR1 Rs. 5,000/-	N	Y	N	Y	N	Y	N	Y
AR2 Rs. 2,000/-	N	N	Y	Y	N	N	Y	Y
AR3 Rs. 0/-	N	N	N	N	Y	Y	Y	Y
ACTION STUB Letter A (Moderate Reminder)			X	X				
LetterB (Severe Reminder)					X	X	X	X
Terse Post Script				X				X
Exception Report								X
GO TO NEXT	X	X	X	X	X	X	X	X

Figure 1.1 Accounts Receivable Programmed Decision Table

The above decision table can be used for writing a program in an appropriate computer language.

It is worthwhile to note the orderly nature of the inquiries into which the analyst is led. In fact this is a most valuable discipline tending to regularize the otherwise random questioning which may occur.

Having expressed the table in as concise a form as possible, a programmer can now proceed directly with the 'encoding' process, or use the table to construct a formal flowchart. Which may then serve as a basis for coding. There are available translation programs which take a decision table as input, and produce as output a program written in a language such as FORTRAN, COBOL or PL/I, or compiled code. Example of this are the Rand Corporation's FORTAB and DBM's Decision Log Translator, both of which produce FORTRAN programs. The DETAB/65 produces a COBOL program.

The accounts receivable structured example draws heavily from the illustration provided by Brookes et al . One can refer to a large number of problem situations that are amenable to the process just illustrated. Primarily the analyst would have to understand the problem on hand by being able to determine a set of operating conditions and the amenable decisions to take by following the set of alternative rules that can be drawn up.

Decision tables are quite graphical in nature and facilitate communications between user, analyst supervisors and affected parties . As we have seen, the decision table expresses primarily a series of conditions; when the conditions are fulfilled, then a rule associated with the condition is executed. A 'header' is used to identify the table and condition stubs describe the various conditions. As already explained earlier, a rule is a procedure for checking the different conditions, and the action statement tells what action to take when a rule is true. The table is read until the conditions for a rule are met and the action described is taken. Then the next scan of the table begins.

Now to familiarise you with the topic a bit more, we illustrate two decision tables as shown in Figure 1.2 and Figure 1.3 for the 'limited entry' and 'extended entry' decision table examples. The illustration pertain to the logic for a 'credit card' purchase authorisation. In this example, a purchase under Rs. 500/- is approved automatically. Purchases between Rs. 500/- and Rs.1,000/- are given authorisation number. Finally for purchases over Rs. 1,000/-, we give an authorisation number and place a "hold" on the customer's account for the amount of purchase. The dicision tables shown in Figure 1.2 and Figure 1.3 are self-explanatory.

CREDIT CARD AUTHORIZATION

CONDITION STUB	DECISION RULES			
	1	2	3	4
Is purchase < Rs. 500/-	Y	N	N	N
Is purchase between Rs. 500/- and Rs. 1000/-		Y	N	N
Is purchase over Rs. 1000/-			Y	N
ACTION STUB Approve with no action	X			
Give authorization no.		X	X	
Place hold on account			X	
Error				X

Figure 1.2: Limited Entry Example

CREDIT CARD AUTHORIZATION

CONDITION STUB Is purchase 'P'	DECISION RULES		
	1 P > Rs. 1000/-	2 500 <P< 1000	3 0<P<500
Approve with no action			X
Give authorization	X	X	
Place hold on account	X		

Figure 1.3: Extended Entry Example

As can be seen the extended entry is somewhat more compact and allow us to use logical conditions as entries and save space. No doubt the tables shown in Figures 1.2 and 1.3 adequately describe the logic for the credit card example and that both the tables are equivalent

Care must be taken by the analyst that the rules themselves must be unique and independent; they cannot and should not contradict one another; and only one rule can apply in a given situation. It really does not matter in what sequence rules are presented, since only one set of conditions can be satisfied at a time.

It would be interesting to make an observation here at this point. Many knowledge based expert systems are also 'rule-based'. They utilise the 'if-then' type of logic. If a set of certain conditions hold', then 'the action or outcome will be...

1.3 UNSTRUCTURED DECISIONS

Thus far we have been discussing the structured programmable decisions which are very large in number and perhaps more easy to handle as compared to the unstructured or relatively less structured decisions which we would now like to discuss. Though fewer in number as compared to the structured situations, this category of decisions is more repetitive in nature, usually 'one-shot' occurrences for which standard responses are usually not available. Hence they require a creative process of problem solving which is specially tailored to meet the requirement of the situation on hand. In fact managers at higher levels in an organisation are usually faced with more such unstructured decision making situations. Some have aptly described the situations as somewhat 'strategic' in nature as compared to the 'tactical' orientation of the structured decisions at the lower levels of management.

Strategic decisions are non-repetitive, vital and important and aim at determining or changing the ends or means of the enterprise.

Since each manager, in the case of such unstructured, non-programmed decisions, may bring his own personal beliefs, attitudes and value judgments to bear on the decision process, it is possible for two managers to reach distinctly different solutions to the same problem, each claiming that he is acting rationally. In fact the ability to make good non-programmed decisions helps to distinguish effective managers from ineffective managers. Unstructured decisions are not simple. They are usually quite complex in nature. We can't shy away from them for someone has to ultimately make these decisions even though there are inherent dangers when confronting ill-structured problems. Non-programmed decisions are essentially new and unique. They have to be often solved de novo. There is no tried and true method of handling them. Unstructured decisions are those in which the decision maker must provide judgment, evaluation and insights into the problem definition.

1.4 ADDITIONAL CATEGORIES

There are many ways of categorising decisions as proposed by various persons from time to time. We have already discussed structured and unstructured situations. Some have termed them as programmed/ programmable and non-programmed/non- programmable decisions. Yet others have talked of routine/repetitive and non-routine/non repetitive decisions.

Some have stated the range of tactical and strategic decisions; others have termed them as minor and major decisions. We can easily have just two classes of decisions as follows:

Class I : Unstructured, Non-programmable, Strategic, Major, Routine, Repetitive, Complex, Long - run.

Class II : Structured, Programmed, tactical, Minor, Non-routine, Non-repetitive, Simple, Short-run

1.4.1 Departmental, Inter-departmental and Enterprise Decisions

Let us discuss decisions that could be departmental, inter-departmental and enterprise decisions. For instance, sanctioning leave to an employee is a departmental decision, but making a slight change in the design of the product is an inter-departmental decision, and entering a new line of business is an enterprise decision. The department level decision is strategic in nature whereas departmental level is tactical in nature.

1.4.2 Organisational and Personal Decisions

When an executive acts formally in his expected role in an organisation, he makes organisational decisions. However, when the manager takes a decision in his personal capacity and not as a member of the organisation, it is known as a personal decision. For instance, transfers that are effected by an executive are organisational decisions. However, an executive who decides to leave the present organisation is making a personal decision.

1.4.3 Individual and Group Decision Making

Decisions may be taken either by an individual or by a group or a Committee. It is difficult to say which is a better method of taking decisions. Each method has its strengths and weaknesses. We are all aware of the delaying tactics that are adopted by institution of committees in the resolution of conflicts. On the other hand, it is argued that two blockheads are better than one. There would be richer ideas and many more alternatives generated in the process. But when it comes to assessment of selection, there could be 'lot of heat' generated. How does one resolve such a situation? Is it by consensus? Or by voting?

i) Individual Decisions

According to Simon, "It is impossible for the behaviour of a single isolated individual to reach any high degree of rationality. The number of alternatives he must explore is so great, the information he would need to evaluate them so vast, that even an approximation to objective rationality is hard to conceive. The individual decision maker is an individual human being - the one factor most vital and most difficult to understand because of various factors such as age, perception, intelligence, experience in a given area, confidence in decision making, time available, resource position, upbringing, family background, and so on that could come into play.

The most mysterious factor is still this decision making individual human being. How and why an individual acts in a certain way at a certain time is still quite a mystery. The individual decision maker could have quite an amount of prejudice and bias that is inherent on account of perceptual processes which act as great filters. We only accept what we want to accept and hence only such information filters down to our senses, and secondly, the perception is highly subjective. The information gets distorted to coincide with our pre-established beliefs, attitudes and values.

These are additionally 'cognitive' constraints. Psychologically we are always uncomfortable with decision making. We are never sure if our choice of the alternative was correct and optimum, until the impact of the implication of the decision has been felt. This makes us feel very insecure and could be one of the many causes of 'stress' in individuals leading to hypertension and other health complications.

No doubt it is important to have adequate and accurate information about the situation for good quality decision making. However, it must be recognised that "an individual has constraints of nature such as physical, psychological, sociological etc. These limit the amount of information the individual can handle".

ii) Group Decisions

As for group decisions, these are usually taken for major issues in order to secure wider cooperation, acceptability and coordination. Usually in a group like situation, the chances of subjective errors are reduced and more options are thrown open. If the group is larger, such decisions suffer from unnecessary delays, deadlocks and petty party politics.

Some advantages of group decisions are

i) Increased acceptance by those affected and hence implementation is easier.

ii) Easier Coordination.

iii) Easier Communication.

iv) More information processed on account of availability of a larger number of specialists in the group.

v) Group decision making is more democratic in nature.

vi) Participative group process builds up a training group for subordinates and others which allows for smooth handover when individuals leave the scene (no vacuum is created).

Let us now enlist some of the **Disadvantages** of group decisions.

i) Group decisions take longer.

ii) Groups can be indecisive.

iii) Groups can compromise

iv) Groups can be dominated.

v) Group members may exhibit "focus effect" viz., the group may just focus on one or a few suggested alternatives and spend all the time in evaluating these and may never come up with other ideas thus limiting the choices.

1.5 DECISION MAKING PROCESS

1.5.1 Simon's Decision Making Model

Let us now look at the decision making process as proposed by Herbert A. Simon. His model is a conceptual framework that divides the decision making process into the following stages or phases:

i) **Intelligence Activities :** At the stage, a search of the environment takes place to identify events and conditions requiring decisions. Data inputs are obtained, processed and examined for clues that may identify problems or opportunities.

ii) **Design Facilities :** At this stage, alternative courses of action are developed, analysed and evaluated. This involves processes to understand the problem, to generate solutions, and to test solutions for feasibility.

iii) **Choice & Implementation Activities :** Here on has to select and alternative as course of action from those available. A choise is made, implemented and monitored.

Though intelligence, design, choise and implementation activities are sequential in nature, the decision making process includes the ability to cycle back to a previous stage as shown in Figure 1.4 Choice and implementation have been shown to be separated for better understanding.

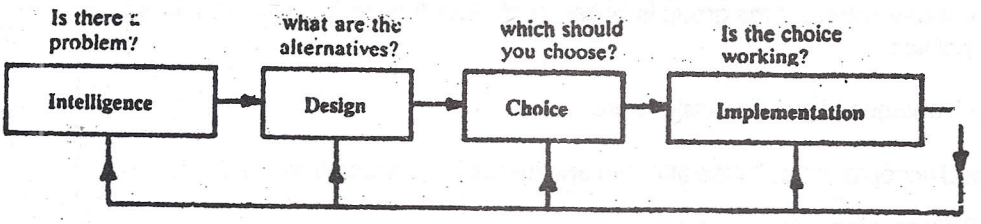

Figure 1.4: Flow Chart of Decision Process

1.5.2 Massie's Decision Making Model

Many step-wise models of the rational decision making process have been proposed over the years. One such proposal by Massie has been found to be most representative as a five stage procedure as follows:

i) Understand situation.

ii) Diagnose and define problem

iii) Find alternatives

iv) select action and

v) Secure acceptance of decision

Figure 1.5 captures the gamut of the decision making process and is quite self-explanatory. You would have by now seen the similarities in the two decision making processes that we have just discussed. However, Simon's model seems to be more preferred to in literature and as such you would find some of the material in this unit also leaning on this model, when discussing on the implications and requirements of the various stages of the decision making process by information system analysts.

We shall not get into concept of data and information which have already been discussed in MS-7 (Information Management and Computers) Unit No.16 on Information Needs and its economics. Suffice it to say that information is the vital resource for managerial decision making.

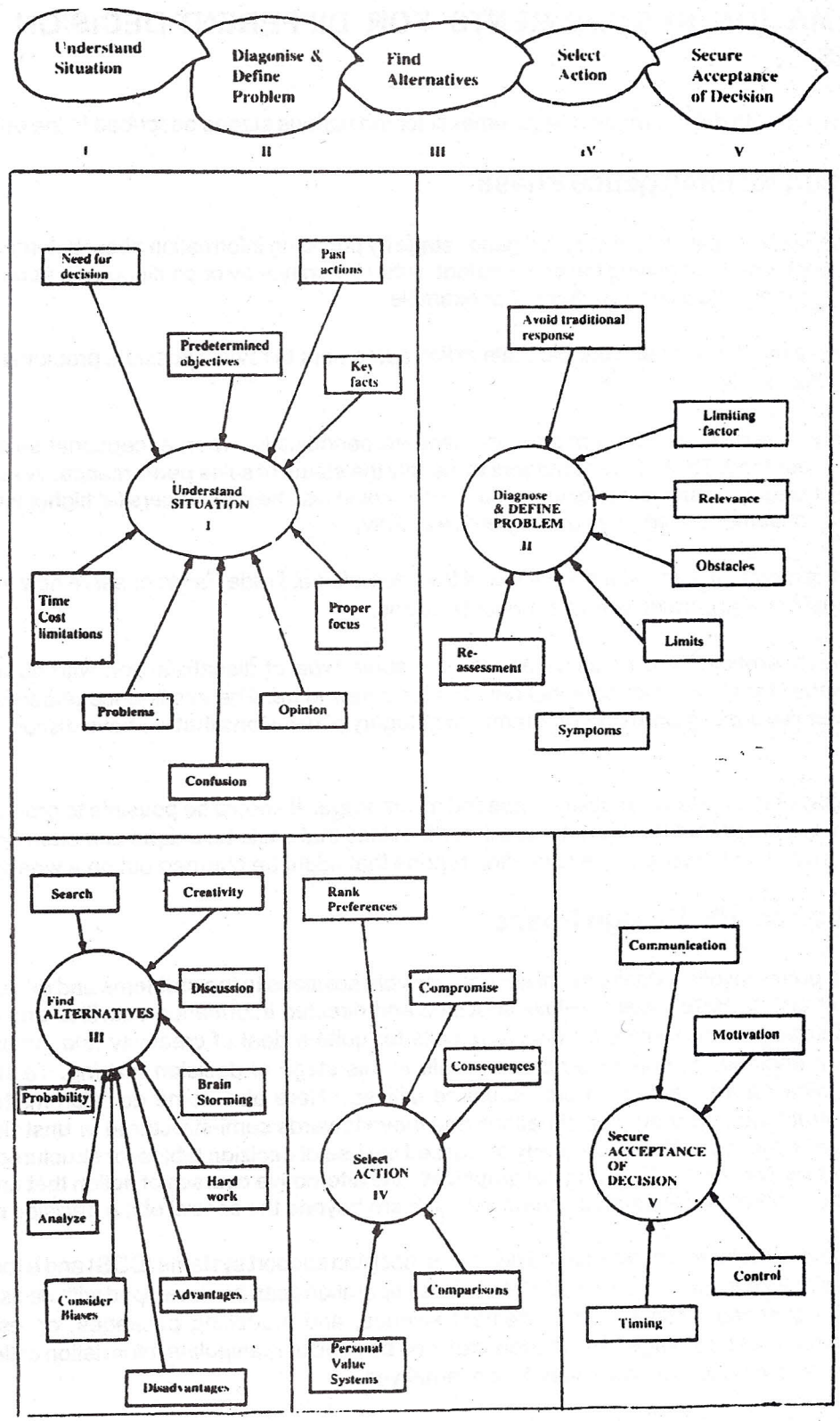

Figure 1.5 Rational Decision Making Model

1.6 INFORMATION REQUIREMENTS FOR DIFFERENT DECISION MAKING STAGES

Let us now lock into the information requirements for the various stages described in the earlier section.

1.6.1 Information for Intelligence Phase

Information Systems can help in the intelligence stage by providing information about external and internal conditions. Intelligence entails scanning the environment, either intermittantly or continuously, depending on the situation to identify potential decision situations. For example:

a) a marketing executive makes periodic visits to key customers to review possible problems and identify new customer needs;

b) Sales analysis reports can be furnished to mangers periodically, when exceptional sales situations occur, or on demand. These help managers to identify the status of sales performance. Also information from market research studies and external databases could also help managers (at higher levels) identify changes in consumer preferences of competitive activity;

c) A design engineer might attend a trade show at the International Trade Fair to observe new materials that may or could be incorporated in future product designs.

The Intelligence phase and its activities result in some type of dissatisfaction with current state or alternatively aid in the identification of potential rewards for a new state. The intelligence phase is the 'tricky' phase and embraces the unstructured non-programmed category of decisions that we have discussed earlier in this unit.

A major information system capability is needed at this stage. It should be possible to provide situation-specific information to managers when they make ad-hoc inquiries that could be unique and often unscheduled. All this should be in addition to some of the exception reports that might be churned out on a weekly basis.

1.6.2 Information for the Design Phase

The design phase involves designing of several possible solutions to the problems and evaluation of the alternate courses of action. Here more carefully specified and directed information activities and capabilities focused on specific designs are required. This stage calls for quite a deal of creativity and innovation. Idea generation and idea engineering could play a useful role in this stage of decision making. Techniques like Brainstorming, Nominal Group Technique etc., could be utilised. Here also some decision might fall in the category of highly structured, programmed situations and move towards semi-structured or unstructured non-programmed decision situations. We have already discussed the use of decision tables for structured situations. Decision trees could also be utilised by laying out graphically the alternative courses of action that are within the control of the decision maker and the states of nature, which are beyond the control of the decision maker.

As for the semi-structured or unstructured decisions, decision support systems (DDS) and expert systems (ES) can provide assistance to managers. Models of business operations can be developed with decision support software, including advanced statistical, management science, and modelling packages, or less complex spreadsheet programs. These packages and models can then be used to manipulate information collected in the intelligence stage to develop and evaluate a variety of alternatives.

Thus the information system should contain models to process data and generate alternative solutions. It should assist with checklists, templates of decision processes, scenarios etc. The models should assist in analysing the alternatives.

1.6.3 Information for the Choice Phase

In this stage a final selection of a particular course of action has to be made out of the various alternatives generated in the preceding design stage. Here a manager can use information tools than can calculate and keep track of the consequences, costs and opportunities provided by each alternative designed in the previous stage. Information systems should help managers select a proper course of action. An information system is most effective if the results of design are presented in a decision-impelling format. The final choice would depend whether there is a single criteria or objective on which it is to be decided or whether the decision situation is one which involves multiple criteria and objectives. Most decision making situationis one which involves multiple criteria and objectives. Most decision making situations fall under the multiple criteria category, which is more difficult and complex and operations researchers are just about getting into this field. The manager is hardly an optimiser now; he believes in satisficing. Worse still, one has to account for factors both subjective and objective, quantifiable and non-quantifiable, tangible and intangible. A technique called Analytic Hierarchic Process (AHP) developed by Saaty is finding a great deal of application in such situations and seems to be becoming a great boon for decision makers. An 'expert choice' software is available for the purpose of prioritisation of alternatives.

The quality of the choice stage depends very much on the quality of inputs made from the previous two stages - intelligence and design phases. It is possible that the manager, even though at the choice stage, might like to refer and return to the previous stages and reopen this issues for more data or alternatives etc.

Information systems can help managers in the choice stage in various ways. Managers can be provided with summarised and organised information emphasising major points such as major assumptions, resources requirements and expected results of each decision alternative. Some type of a 'what-if' simulation analysis could be established.

1. 6. 4 Information for the Implementation Phase

This is the final stage of the decision making process. It is concerned with implementing and monitoring. When the choice is made in the previous stage, the role of the system changes to the collections data for further feedback and assessment. The information systems must help managers monitor the successful implementation of the decision. Here managers can use a reporting system that delivers routine reports on the progress of a specific solution. Some of the difficulties that arise are resource constraints, and possible ameliorating actions. Support systems can range from full-blown Management Information Systems to much smaller systems and project planning (PERT/CPM based) software operating on micro-computers. Feedback about business operations affected by a decision helps a manager assess the decision's success or failure, and whether follow-up decisions are needed.

1.7 RATIONAL INDIVIDUAL MODELS OF DECISION MAKING

Because organisations are made up of individuals, it makes sense to build information systems that facilitate individual decision making, wherever possible. Different assumptions have been made while proposing some model or the other.

1.7.1 Rational Model

Some economists, mathematicians and management experts believe that the decisions are always made rationally because the decision maker:

* knows his or her objectives and ranks them in order of importance;
* knows all possible alternative solutions to the decision problem;
* knows the relative pros and cons of each alternative; and
* chooses the alternative that maximises attainment of the objective.

Such idealistic assumptions have their share of criticism. Decision makers are not so well informed as to consider all the alternatives or to know all consequences. Moreover, it is not just a singular objective that is pursued in real life situations. Still, despite these criticisms, the rational model remains a powerful and attractive model of human decision making.

1. 7. 2 Bounded Rationality and Satisficing

Instead of searching for all the alternatives and consequences (unlimited rationality) as in the preceding model, people limit the search process to sequentially ordered alternatives (alternatives that are not radically different from the current policy. Wherever possible they avoid new, uncertain alternatives and rely instead on tried-and true rules, standard operating procedures) and programmes. Individuals and/or organisations have multiple goals, some in conflict with each other also. Even goals are prioritised or placed in a hierarchy.. In this way rationality is bounded. Simon proposes the 'satisficing' approach rather than the 'optimising approach'

1. 7. 3 Muddling through Model

In 1959, Lindblom proposed the most radical departure from the rational model in his article on the "science of muddling through". He described this method of decision making, as one of "successive limited comparisons". Here values are chosen at the same time as policies, and no easy means - end analysis is possible. For instance labour and management can rarely agree on values, but they can agree on specific policies. Because of the limits on human rationality, Lindblom proposes, "incremental decision making ", or choosing policies most like the previous policy. Non-incremental policies are a political (not likely to bring agreement among important groups) and dangerous as nobody knows what they will lead to . Lastly, it is argued that choices are not "made". Instead decision making involves a continuous process in which final decisions are always being modified to accommodate changing objectives, environments, value preferences and policy alternatives provided by decision makers.

1.7.4 Psychological Types and Frames of Reference

The psychologists have given an additional perception to the rationality concept. They say that humans differ in how they maximise their values as well as in using the frame of reference of interpreting information and making choices. Here we hear about the 'cognitive style' that refers to underlying personality di positons in the treatment of information, the selection of alternatives and the evalution of consequences. Systematic thinkers impose order in perceptions and evaluation; intuitive thinkers are more opened unexpected information and use multiple models and perspectives when evaluating information. Neither is more rational than the other.

Some studies have found that humans have a deep seated tendency to avoid risks. when seeeking gains but to accept risks in order to aviod losses. In other words, people are more sensitive to negative outcomes than to positive ones.

1.7.5 Implications of the Models for Information System

Decision making is not a simple process and hence some guidenlines need be kept in mind when designing information system. The following characteristics of information systems could be encouraged:

- they are flexible and provide many options for handling data and evaluating information.
- they are capable of supporting a variety of styles, skills and knowledge.
- they are capable of changing as humans learn and clarify their values.
- they are powerful in the sense of having multiple analytical and intuitive models for the evaluation of data and the ability to keep track of many alternatives and consequences.

1.8 ORGANISATIONAL MODELS FOR DECISION MAKING

Just as we descussed rational individual decision making, it is useful to think also of organisational decision making. The models of organisational choice have been portrayed in Table1.

Table 1 : Models of Organisational Choise

Name	Basic Concept	Interence Pattern
Rational factor	Comprehensive rationality	Organisations select goal(s) examine all alternatives and then choose a policy that maximises the preference function.
Bureaucratic	Organisational out put	Goals are determined by resource constraints and existing human & capital resources. Standard operating procedures are combined into programs, programs into repertoires; these determine what policies will be chosen. The primary purpose of the organisation is to survive; uncertaity reducition is the principal goal. Policies are chosen that are incrementally different from the past.
Political	Political outcome	Organisational decisions result from political competition; key players are involved in a game of influence, bargaining and power. Organisational outcomes are determined by the beliefs and goals of players, their skills in playing the game, the resources they bring to bear, and the limits on their attention and power.
Garbage can	Non-adaptive organisation programs	Most organisations are non-adaptive, temporary and disappear over time. Organisational decisions result from interactions among streams of problems, potential actions, paticipants, and chance.

Source : *Kenneth C. Laudon & J.P. Laudon, Management Information Systems : A Contemporary Perspective, Collier Macmillan Pub. Co. U.K., 1988. Pg. 141 Table 5.8*

1.8.1 Implications for Information System Design

As can be seen from Table 1, the designers of systems just can't think of individual decision making models but would have to consider organisational decision making. Systems must do more than merely promote decision making. They must also include the notion of making individual managers better managers of existing

routines, better players in the bureaucratic struggle for control of an organisations's agenda, and better political players. In fact also systems should help bring a measure of power to those who can attach the right solution to the right problem.

1.9 SUMMARY

Management and decision making are complex activities that involve many dimensions of human behaviour. Early classical models of management stressed the functions of managers namely planning, organising, staffing, coordinating, reporting, budgeting. Depending on the level at which managerial decision makers are, they perform a different mix of managerial functions. There are primarily three levels of management and decision making termed as strategic, technical / tactical and operational decision making.

In conclusion, management decision making quality depends on the vital input of information so as to support the functions that a manager performs; the levels at which the decision maker is, and on the type of decisions, whether structured or otherwise.

1.10 KEY WORDS

Business Systems Analyst : A systems analyst tied to an end-user business area with specialised understanding of the business information requirements of that functional area. The analyst is responsible for translating those specific business requirements into information systems for that functional area.

Cognitive Styles : Basic patterns in how people handle information and control problems.

Decision Making Process : A process of intelligence design, choice and implementation of a particular course of action (Simon's Model).

Decision Table : A method of documenting decision rules in matrix or tabular form, showing a set of conditions, and the actions that can be taken on these conditions.

Procedures : Set of instructions used by people to complete a task.

Structured Decision : Type of decision that is repetitive, routine and can be structured and programmed.

Unstructured Decision : One in which the decision maker must provide judgment, evaluation, and insight because the decision problem is novel, non-routine, and has no agreed- upon procedure for solving it and is usually unstructured and non- programmable.

1.11 SELF-ASSESSMENT EXERCISES

1. Define structured and unstructured decisions. Give four examples of each.
2. Discuss the rational individual models of decision making. What are the implications of these models to information system analysts?
3. Describe the organisational choice models. How would the design of system be affected by the choice of model employed?
4. Prepare a decision table based on the information given below :

   An educational institute wishes to make a statistical listing of all seniors. If the senior is a male and a veteran, he will have a "V" printed after his name. A male student will have his marital status printed.

If the student is a female and single, she will have her name and phone number printed if she is over 20 and less than 26 years old. Single females under 20 will only have their names printed. Single females 26 and over will have their date of birth printed. All married females will have their marital status printed.

1.12 FURTHER READINGS

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