

UNIT III EVOLUTION OF INFORMATION SYSTEM

- EDP (electronic data processing) system,
- Management information systems (MIS),
- Executive information systems,
- Information needs of organization,
- ERP as an integrator of information needs at various levels,
- Decision making involved at the above level.

1. ELECTRONIC DATA PROCESSING (EDP)

EDP (electronic data processing), an infrequently used term for what is today usually called "IS" (information services or systems) is the processing of data by a computer and its programs in an environment involving electronic communication. EDP evolved from "DP" (data processing), a term that was created when most computing input was physically put into the computer in punched card form and output as punched cards or paper reports.

Electronic data processing (EDP) can refer to the use of automated methods to process commercial data. Typically, this uses relatively simple, repetitive activities to process large volumes of similar information. For example: stock updates applied to an inventory, banking transactions applied to account and customer master files, booking and ticketing transactions to an airline's reservation system, billing for utility services.

Data is the smallest atomic entity in the information system which is basic to build the information system. The character of data decides the quality of information it provides to the user. If the data is taken care of properly, its usage will ensure quality output. Therefore, in any information system significant care is taken in building the data as a first level input to the system. The data is built through data design and modeling process that provides specification and character to the data. Through the information system, these specifications and characters are used for a number of applications. Data processing is handling raw data in a systematic manner to conform to the data quality standards as determined by the designer of the information system.

ERP deployment has two parts:

- i. Selection and
- ii. Implementation.

Selection involves spending time in just listening to the views of a number of people who are involved. Since there are bound to be differences of opinion, especially among people who are very senior in the management, it is an area which should not be left to the EDP setup alone and the senior most manager even the CEO must get involved. The selection criteria should go beyond technical issues-they should include business concerns like proven expertise of the vendor, especially in the desired industry, along with support infrastructure.

Implementation time is also reduced by selecting a system which is simple and offers smart tools for system administration. A system which offers an abundance of unnecessary features can only

increase the implementation time. System which offer a consistent interface and which support both graphical and character interfaces, also help in cutting down implementation time. As regarding actual implementation time, it can be cut down by working on a proven methodology, with partners and certified consultants who are experts in their line.

2. MANAGEMENT INFORMATION SYSTEM (MIS)

A system to convert data from internal and external sources into information and communicate that information in an appropriate form, to managers at all levels in all 3 functions to enable them to make timely and effective decisions for planning, directing and controlling the activities for which they are responsible. Management Information Systems (MIS) is the application of information technology to support business activities.

MIS refers broadly to a computer-based system that provides managers with the tools for organizing, evaluating and efficiently running their departments. In order to provide past, present and prediction information, an MIS can include software that helps in decision making, data resources such as databases, the hardware resources of a system, decision support systems, people management and project management applications, and any computerized processes that enable the department to run efficiently.

Within companies and large organizations, the department responsible for computer systems is sometimes called the MIS department. Other names for MIS include IS (Information Services) and IT (Information Technology).

Efficient MIS enables management to plan co-ordinate, organize and control. It provides information needed for strategic planning and for day to day operations. The various levels of management typically require the information they receive to be formatted in different ways. These different levels of management decision-making can be described as follows: strategic, tactical and operational. So the information could be:

2.1 Stages in the development of Management Information Systems

Organizations have always had some kind of management information systems, even if it was not recognized as such. Developments in the use of the new technology have gone through several stages.

Stage 1: EDP. When computers were first introduced into organizations, they were used mainly to process data for a few business functions – usually accounting and billing. Computers were located in electronic data processing (EDP) departments, because of the specialized skills needed to operate the extensive and complex system.

Stage 2: MIS. The growth of EDP departments spurred managers to focus more on planning their organizations' information systems. As the EDP departments' function expanded beyond routine processing of masses of standardized data, they began to be called management information system (MIS) departments. MIS uses data created mainly in the EDP departments and it can be developed only when there already exists such department. It does not make any changes in these data. MIS could obtain information from internal and external sources.

Stage 3: DSS. Later on, when remote terminals were introduced, more than one department began to use the same system. At this stage the MIS has grown beyond a data

Processing role and included the provision of a number of decision support systems (DSSs). While the MIS controls routine operations using data processing methods, the DSS is seen as supporting decisions on “less routine issues” and solving “semi structured” problems.

Stage 4: ARTIFICIAL INTELLIGENCE and EXPERT SYSTEMS. One of the fastest growing areas of information technology, artificial intelligence uses the computer to simulate some of the characteristics of human thought. The term artificial intelligence (AI) means the simulation of human thought process in order to select the best mode of behavior, e. g. taking a decision or responding to a situation. Expert systems are a major application of AI. They act like a human “expert” in analyzing unstructured situations. Expert systems are also called “knowledge-based” systems since they are built on a framework of known facts and responses to situations. It is believed that we are moving rapidly from industrial-based society to an information based one. The application of computer technology to management information and decision support systems has certainly had an effect on how managers perform their tasks and on how organizations behave.

An MIS provides the following advantages.

1. It Facilitates planning: MIS improves the quality of plants by providing relevant information for sound decision – making. Due to increase in the size and complexity of organizations, managers have lost personal contact with the scene of operations.
2. In Minimizes information overload: MIS change the larger amount of data in to summarize form and there by avoids the confusion which may arise when managers are flooded with detailed facts.
3. MIS Encourages Decentralization: Decentralization of authority is possibly when there is a system for monitoring operations at lower levels. MIS is successfully used for measuring performance and making necessary change in the organizational plans and procedures.
4. It brings Co ordination: MIS facilities integration of specialized activities by keeping each department aware of the problem and requirements of other departments. It connects all decision centers in the organization.
5. It makes control easier: MIS serves as a link between managerial planning and control. It improves the ability of management to evaluate and improve performance. The used computers has increased the data processing and storage capabilities and reduced the cost
6. MIS assembles, process, stores, Retrieves, evaluates and disseminates the information.

2.2 Early MIS Efforts

By the mid 1960, most large firms had finally overcome the pains of implementing their first computer system. It had been a difficult task, for those organizations had accumulated huge volumes of data and much effort was required to put the data in a form that was acceptable to the computers. Punched card and key driven machines were used only for data processing. Only a few computer literate people in the firms and those specialists had no real experience in guiding the implementation through the steps of the system life cycle. Managers became aware of computer’s processes and power.

2.3 An MIS Model

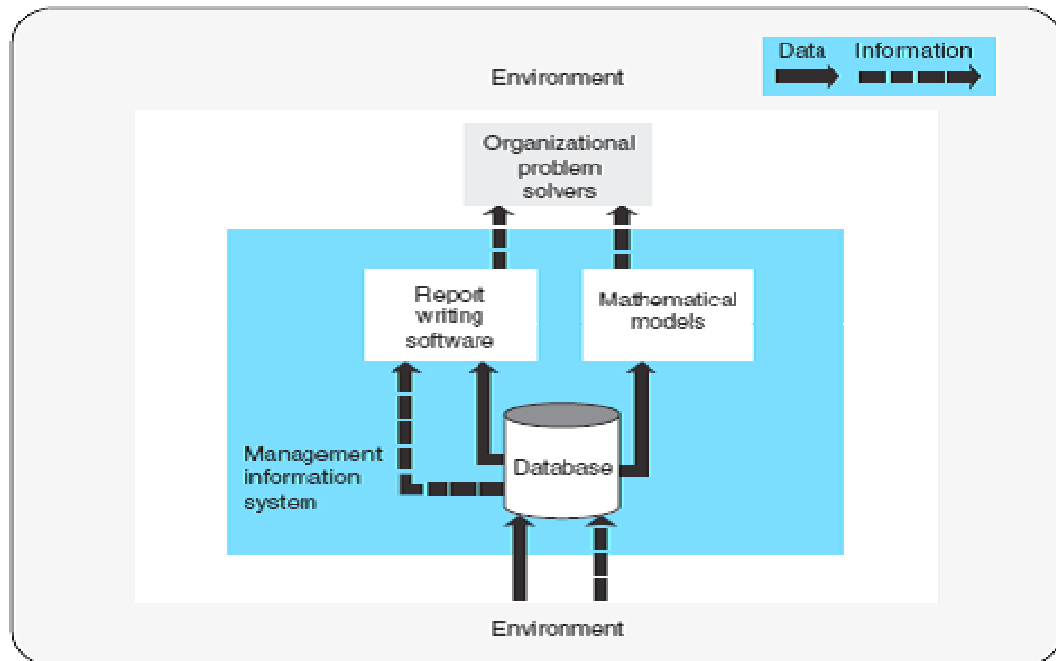


Figure 3.1 An MIS model

- **Management Information System (MIS)** is a computer-based system that makes information available to users with similar needs.
- **Data base** - The data base contains the data provided by the accounting information system. The data base contents are used by software that produces reports as well as mathematical models.
- **Report-writing software** – produces both periodic and special reports.
- **Mathematical models** – produces information as a simulation of the firm's operations
- **Organizational problem solver** -The software outputs are used by persons who are responsible for solving the firm's problem.

3. EXECUTIVE INFORMATION SYSTEM

An **Executive Information System (EIS)** is a type of management information system intended to facilitate and support the information and decision making needs of senior executives by providing easy access to both internal and external information relevant to meeting the strategic goals of the organization. It is commonly considered as a specialized form of a Decision Support System (DSS).

The emphasis of EIS is on graphical displays and easy-to-use user interfaces. They offer strong reporting and drill-down capabilities. In general, EIS are enterprise-wide DSS that help top-level executives analyze, compare, and highlight trends in important variables so that they can monitor performance and identify opportunities and problems. EIS and data warehousing technologies are converging in the marketplace.

In recent years, the term EIS has lost popularity in favour of Business Intelligence (with the sub areas of reporting, analytics, and digital dashboards).

3.1 Applications

EIS enables executives to find those data according to user-defined criteria and promote information-based insight and understanding. Unlike a traditional management information system presentation, EIS can distinguish between vital and seldom-used data, and track different key critical activities for executives, both which are helpful in evaluate if the company is meeting its corporate objectives. After realizing its advantages, people have applied EIS in many areas, especially, in manufacturing, marketing, and finance areas.

3.1.1 Manufacturing

Basically, manufacturing is the transformation of raw materials into finished goods for sale, or intermediate processes involving the production or finishing of semi-manufactures. It is a large branch of industry and of secondary production. Manufacturing operational control focuses on day-to-day operations, and the central idea of this process is effectiveness and efficiency. To produce meaningful managerial and operational information for controlling manufacturing operations, the executive has to make changes in the decision processes. EIS provides the evaluation of vendors and buyers, the evaluation of purchased materials and parts, and analysis of critical purchasing areas. Therefore, the executive can oversee and review purchasing operations effectively with EIS. In addition, because production planning and control depends heavily on the plant's data base and its communications with all manufacturing work centers, EIS also provides an approach to improve production planning and control.

3.1.2 Marketing

In an organization, marketing executives' role is to create the future. Their main duty is managing available marketing resources to create a more effective future. For this, they need make judgments about risk and uncertainty of a project and its impact on company in short term and long term. To assist marketing executives in making effective marketing decisions, an EIS can be applied. EIS provides an approach to sales forecasting, which can allow the market executive to compare sales forecast with past sales. EIS also offers an approach to product price, which is found in venture analysis. The market executive can evaluate pricing as related to competition along with the relationship of product quality with price charged. In summary, EIS software package enables marketing executives to manipulate the data by looking for trends, performing audits of the sales data, and calculating totals, averages, changes, variances, or ratios. All of these sales analysis functions help marketing executives to make final decisions.

3.1.3 Financial

A financial analysis is one of the most important steps to companies today. The executive (Eddie Frame) needs to use financial ratios and cash flow analysis to estimate the trends and make capital investment decisions. An EIS is a responsibility-oriented approach that integrated planning or budgeting with control of performance reporting, and it can be extremely helpful to finance executives. Basically, EIS focuses on accountability of financial performance and it recognizes the importance of cost standards and flexible budgeting in developing the quality of information provided for all executive levels. EIS enables executives to focus more on the long-term basis of current year and beyond, which means that the executive not only can manage a sufficient flow to maintain current operations but also can figure out how to expand operations that are contemplated over the coming years. Also, the combination of EIS and EDI environment can help cash managers

to review the company's financial structure so that the best method of financing for an accepted capital project can be concluded. In addition, the EIS is a good tool to help the executive to review financial ratios, highlight financial trends and analyze a company's performance and its competitors.

3.2 Advantages

- i. Easy for upper-level executives to use, extensive computer experience is not required in operations
- ii. Provides timely delivery of company summary information
- iii. Information that is provided is better understood
- iv. Filters data for management
- v. Improves to tracking information
- vi. Offers efficiency to decision makers

3.3 Disadvantages

- i. Functions are limited, cannot perform complex calculations
- ii. Hard to quantify benefits and to justify implementation of an EIS
- iii. Executives may encounter information overload
- iv. System may become slow, large, and hard to manage
- v. Difficult to keep current data
- vi. May lead to less reliable and insecure data
- vii. Small companies may encounter excessive costs for implementation

3.4 What Do Executives Do?

- Term executive is loosely applied
 - No clear dividing line between executives and other managers.
- Executive manager on the upper level of the organizational hierarchy who exerts a strong influence on the firm.
- Executive manager on the lower level distinguished by their attitude.
- Executive assign a higher value to the welfare of the firm than to the welfare of individual units within the firm.
- Executives tend to be company oriented.

3.5 An EIS Model

Executive information system or EIS are used by the firm's executives. It is a system that provides information to the executive on the overall performance of the firm.

EIS model consists of

- Executive workstation
- Central computer

3.6 EIS Implementation Decisions

Three Key Questions:

- Do we develop an EIS? When the answer is no, the executives continue to rely on their present systems. When the answer is yes, the next question is
- “Is there prewritten personal productivity software available to meet the executive’s needs?” If so, it is purchased.
- If not, the next question is “Should we purchase prewritten EIS software?” if so, it is purchased. If not, the firm’s information services staff creates custom EIS software.

3.6.1 Prewritten personal productivity software

It is general purpose software that anyone can use to develop his or her own applications. Examples are DBMS, electronic spreadsheet packages.

3.6.2 Prewritten EIS software

Prewritten EIS software, which is specially designed to meet the information needs of executives.

Advantages of Prewritten Software

- Fast
- Doesn't strain information services
- Tailored to executives

3.6.3 Future EIS Trends

- Use will become commonplace
- Decreasing software prices
- Will influence MIS/DSS
- The computer will always play a support role

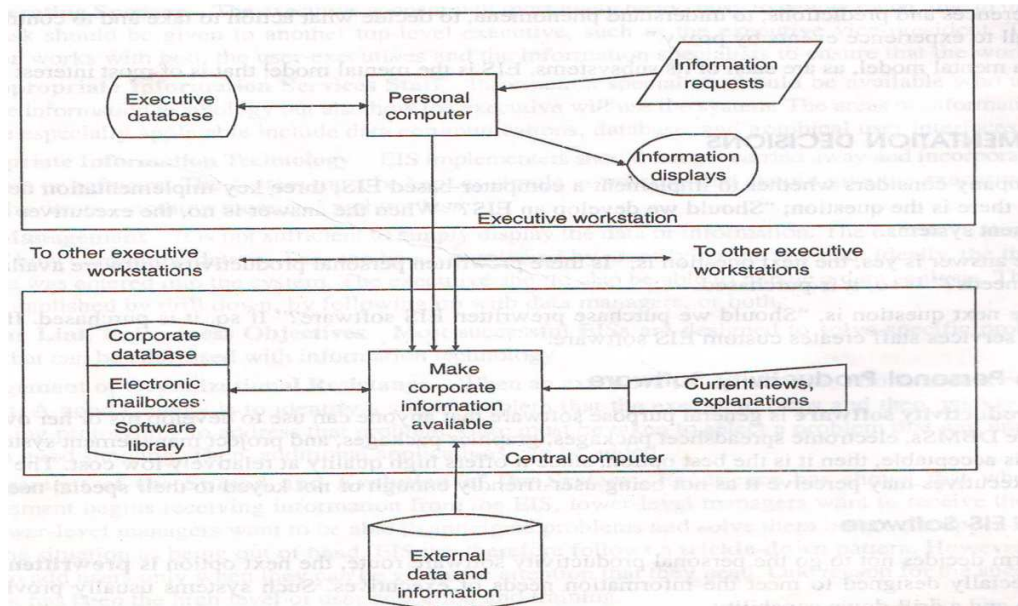


Figure 3.2 The EIS model

4. INFORMATION NEEDS OF ORGANIZATION

4.1 Human resource management

The major goal of human resource management is to make best use of the available human resources in the organization. To attain this goal, the information necessary at various levels of management is as follows:

(i) Strategic information

- Long range human resource requirements at different levels
- Policies on wages and incentives such as stock options
- Policies on human resource development and training
- Policies on personnel welfare and facilities

(ii) Tactical information

- Performance appraisal
- Demographic make-up of personnel and its impact on retirement
- Production incentives and relation to productivity
- Morale of personnel
- Absentee reduction
- Leave and overtime policies
- Personnel development policies

(iii) Operational information

- Routine assessment
- Skills inventory
- Loans/advances and recoveries
- Leave record

4.2 Production Management

The goal of production management is to optimally deploy human resources, machines and materials to maximize production of goods by the organization. To attain this goal the following types of information would be needed:

(i) Strategic

- Yearly and monthly production quotas and alternate schedules
- Policies on machine replacement, augmentation, and modernization
- Information on the introduction of new production technologies
- Identifying best product mix

(ii) Tactical

- Identifying and controlling areas of high cost such as work in progress inventories
- Identifying critical bottlenecks in production
- Identifying alternate production schedules based on tools, machines, material, and personnel availability
- Performance measures of machines (breakdown histories and cost of repair and failure) to decide on replacement

(iii) Operational

- Monitoring up to date production information by examining assemblies, detecting likely shortages and giving early warning
- Scheduling better production dynamically
- Preventive maintenance schedules of machines
- Monitoring tools, machines and human resource availability

4.3 Materials management

The main goal of materials management is to have readily available materials needed by the organization and to keep optimal levels of stock of items. To achieve this goal the following types of information would be needed:

(i) Strategic

- Developing vendors for critical items
- Determining optimal levels of inventory
- Determining proportion of material to be ordered from different vendors
- Reducing varieties of inventory

(ii) Tactical

- Developing vendor performance measures
- Determining the impact on material cost, availability and procurement with design changes and new product introduction
- Determining optimal reorder value
- Controlling high value inventory

(iii) Operational

- Goods received, rejected and issued
- List of excess and deficient items received
- List of items rejected
- Critical items received
- Backlog of supplies
- Stores in transit and in inspection
- Value of inventory

4.4 Finance management

The main goal of this function is to ensure financial viability of the organization, enforce financial discipline and plan and monitor the budget. The various levels of information required to meet these goals are as follows:

i) Strategic

- Methods of financing
- Pricing policies
- Tax planning

(ii) Tactical

- Variance between budget and expenses
- Large outstanding payments/receipts
- Credit and payment status
- Cost increases and pricing
- Impact of taxation on pricing

(iii) Operational

- Periodic financial reports
- Budget status to all functional managers
- Tax returns
- Share registration and transfers
- Profit and loss account
- Payments and receipts
- Payroll, provident fund accounts
- Calculation of direct costs-overheads-standard cost.

4.5 Marketing management

The goal of this function is to maximize sales and ensure customer satisfaction. To attain this goal the various types of information needed are:

i) Strategic

- Search for new markets and marketing strategies
- Analysis of competitors strategy
- Technology and demographic forecasts and product changes

(ii) Tactical

- Advertising techniques and analysis of their impact
- Customer preferences surveys
- Correlation of prices and sales
- Sales force deployment and targets
- Exploring alternate marketing channels
- Timing of special sales campaigns

(iii) Operational

- Sales analysis by regions, customers class, sales persons
- Sales target versus achievement
- Market share and trends
- Seasonal variations
- Effect of model changes
- Performances of sales outlets
- Costs of sales campaigns and benefit.

4.6 Research, design and development management

The goal of this function is to continuously improve existing products and develop new products and processes. To attain this goal following types of information are needed:

i) Strategic

- Which products are to be developed?
- What types of improvements are required?
- What long range research is most promising?
- What technical collaboration would be appropriate?
- What areas would require new human resource inputs?

(ii) Tactical

- Setting intermediate goals for projects and assess progress
- Checking availability of equipment and appropriate selection
- Determining proportion of resources to be allocated to various parts of a project
- Deployment of personnel to projects based on talent and performance
- Information on similar and related research projects undertaken by other groups

(iii) Operational

- Progress against goals
- Budgeted expenses versus actual
- Status of outstanding orders for equipment and components

5. ERP AS AN INTEGRATOR OF INFO NEEDS AT VARIOUS LEVELS

To survive in today's competitive world one has to manage the future. Managing the future means managing the information. In order to deliver high quality information to the decision-makers at the right time in order to automate the process of data collection, collation and refinement, organizations have to rely on information technology, harness its full potential and use it in the best possible way.

In today's competitive business environment, the key resource of every organization is information. If the organization doesn't have an efficient and effective mechanism that enables it to give the decision makers the right information at the right time, then the chances of its success are very remote.

The three fundamental characteristics of information are accuracy, relevancy and timeliness. The information should be accurate, it should be relevant for the decision-maker and it must be available to the decision-maker when he needs it. Today, the time available for an organization to react to the changing market trends is very short. To survive, the organization must always be on its toes, gathering and analyzing the data-both internal and external. Any mechanism that will automate this information gathering and analysis process will enhance the chances of the organization to beat the competition.

One of the major drawbacks of the Legacy systems was that it did not have an integrated approach. Various departments of an organization have varied components that operate in isolation. So if a person wanted some information which had to be derived from more than one system, he had to get the necessary reports from all such component systems and then correlate and combine the data.

But in reality, an organization cannot function as islands of different departments. If all the information islands, which were functioning in isolation, were integrated into a single system, then the impact of that would be dramatic. For example, if the purchase department can see the purchase planning details, it can make the purchasing schedule. If the finance department can see the details of the purchase as soon as it is entered into the system, it can plan for the cash flow that will be necessary for the purchases.

Since the systems work in isolation, collecting and analyzing the data needed for the functioning departments, as well as getting information about some aspect that is dependent on more than one department, becomes a difficult task. It is very difficult for the business executive or decision maker

to make good decisions with the isolated data that he will get from the various reports produced by each department. Even if he manipulates the data and produces the necessary information required, he would lose valuable time that might otherwise be spent in decision making for that process.

So what is needed is a system that treats the organization as a single entity and caters to the information needs of the whole organization. If this is possible, and if the information which is generated is accurate, timely and relevant, then these systems will go a long way in helping the organization to realize its goals. This is the strength of ERP systems- integration and automation- and that is why implementation of ERP systems will help in improving the accuracy of information and thus help in better decision-making.

6. DECISION MAKING INVOLVED AT THE ABOVE LEVEL

Much of management is decision making, according to one of the many approaches to management. While there are several views of what constitutes management, according to the decision-oriented view, management mainly comprises the following:

- Planning
- Organizing
- Coordinating
- Directing
- Control

Each one of these functions may be at the strategic, tactical or operational level.

6.1 Planning

Strategic level planning requires considerable amount of environmental information like shifting markets, changing technology as well as internal information like core competitive strength of the organization.

Tactical planning activities such as vendor development, make-or-buy decisions would call for cost and availability information pertaining to materials and production capacities which are internal as well as external to the organization.

Operational planning like staff scheduling requires large amount of internal information, e.g., schedules, attendance, up times of equipment.

6.2 Organizing

Strategic organizing needs external and internal data to decide on re-structuring as well as to forge Strategic partnerships.

Tactical organizing requires changing wage-level data of the organization as well as that of competitors.

Operational organizing needs data relating to skills and training requirements of the operational staff.

6.3 Coordinating

Strategic coordination calls for industry-wide data corresponding to technology availability.

Tactical coordination calls for plant-wide and supplier-wise bottleneck data that reflect deficiency both inside and outside the organization.

Operational coordination requires itemized breakup of plant and machinery performance, failures, etc.

6.4 Directing

Strategic directing functions such as introduction of office automation requires detailed cost-benefit analysis of new technologies.

Tactical directing, e.g. innovative marketing strategy, needs detailed market and production data.

Operational directing function requires detailed data pertaining to the individual managers skills.

6.5 Control

Strategic control decisions like total quality management needs detailed performance data and benchmarking data from outside the organization.

Tactical control decisions like maintaining steady market share in the medium run would necessitate continuous monitoring of plant data.

Operational control may call for techniques of statistical process control which involves the collection of substantial sampling information that must be collected and processed continuously during the entire production period.

According to Simon, all decisions, cutting across the disciplines and levels of management, can be classified into two types:

- i. **Programmed decisions:** programmed decisions are those decisions which can easily be automated, like the determination of optimal product mix, minimum cost production schedule, optimal sequencing of machines to minimize mean flow time, etc. Generally such decisions are characterized by large data and a few decision rules or algorithms that use the data in an automated fashion to arrive at an optimal plan. Techniques of operations research like linear programming, represents a typical example of this category of decisions that use formal data and algorithms. Such decisions are easily programmed. The key to such programmability is the underlying structure of these decision situations that permit an algorithmic translation. Information support for such programmed decisions can be designed easily. It is intended that such programmed decisions are unimportant, trivial, or simple. There are no value judgments to such programmed decisions. Many of the

programmed decisions may need the most challenging algorithms involving the best brains available at that moment for their solution.

- ii. **Non-programmed decisions:** Non-programmed decisions, do not lend themselves to easy automation. The model support for such programmed decisions requires more of heuristics than optimal algorithms. Optimization algorithms are formalized procedures readily implementable as finitely terminating computer programs with guaranteed outcome of optimal solutions, whenever they exist. Heuristics generally yield only near optimal and not optimal solution, and cannot therefore guarantee optimally. The heuristics themselves may be implemented in the form of an algorithmic procedure and solved on a computer; however the decision situation may not admit any optimal algorithm. Information support for non-programmed decisions would obviously be very different. The non-programmed decisions would often use unstructured and uncertain data. Flexible access to data, user friendliness, GUI's natural language support, what-if analysis capability etc characterize information support for non-programmed decisions.