USE OF INFORMATION SYSTEMS IN MANAGEMENT

Information system

Information system has been defined in terms of two perspectives: one relating to its function; the other relating to its structure. From a functional perspective; an information system is a technologically implemented medium for the purpose of recording, storing, and disseminating linguistic expressions as well as for the supporting of inference making.

From a structural perspective; an information system consists of a collection of people, processes, data, models, technology and partly formalized language, forming a cohesive structure which serves some organizational purpose or function. The functional definition has its merits in focusing on what actual users - from a conceptual point of view- do with the information system while using it. They communicate with experts to solve a particular problem. The structural definition makes clear that IS are socio-technical systems, i.e., systems consisting of humans, behavior rules, and conceptual and technical artifacts.

An information system can be defined technically as a set of interrelated components that collect (or retrieve), process, store, and distribute information to support decision making and control in an organization. In addition to supporting decision making, coordination, and control, information systems may also help managers and workers analyze problems, visualize complex subjects, and create new products.

Three activities in an information system produce the information that organizations need to make decisions, control operations, analyze problems, and create new products or services. These activities are inputting, processing and outputting. Input captures or collects raw data from within the organization or from its external environment. Processing converts this raw input into a more meaningful form. Output transfers the processed information to the people who will use it or to the activities for which it will be used. Information systems also require feedback, which is output that is returned to appropriate members of the organization to help them evaluate or correct the input stage.

Components of an Information System:

The components that make up an IS are:-

1. Hardware – This is a set of devices such as the processors, printers and monitor. Also includes mainframes and minicomputers that can accept data and process them respectively.
2. Software –A set of instructions or program that enable the hardware to process data. These can be classified into system software and application software.
3. Databases – This is a collection of related files or tables that store data and their association or relations among them.
4. Network – This is a connecting system that allows the sharing of the resources by different computers.
5. Procedures – This is a set of instructions about how to combine the above components in order to process information and generate the desired output.
6. People – These are the individuals who work with the system or use its output

Importance of Information system in management

The main purpose of Information System is to provide the management the necessary information for decision making. In order to achieve this purpose MIS is to perform the following functions.

Collection of data: The first function of MIS is to collect necessary data from both internal and external sources of the organization. The data of the organization which have already been gathered are kept in some physical medium such as a paper form or entering it directly into computer system.

1. Processing data: After storing the data, the next important function of MIS is to process the same. In the processing, the data are converted to require management information, calculating company, sorting, classifying and summarizing etc. are the necessary activities to be done for processing the data.
2. Storage of information: Under the MIS, necessary data and information are carefully stored, so that it can save time for searching the same. Generally, data and information are stored by reserving and organizing them in the form of files, records and databases for future use.
3. Retrieval of information: Another function of MIS is to retrieve the information to meet the exact management information demands. So retrieval should be done as per the requirement of the management users.
4. Disseminating: Disseminating is the last function or finished product of MIS. By disseminating the data and information are divided and distributed to the users in an organization. This can be done through reports or outline through computer terminals periodically.

An Organization as a System

Standard

ENVIRONMENT

* + Customers
  + Suppliers
  + Competitors
  + Govt. Policies

Management

Polices & decision making

Control

Service or Goods

Raw materials energy Human labor

Transformation

#### INPUT PROCESSING OUTPUT

CONTROL PRINCIPLES

Control is the process of ensuring that operations proceed according to plan and at the most basic level-this is done by comparing the actual results or output of the system against a target and using any differences found to adjust the input side of the system so as to bring activities in line with the target. In practice the target may be termed a norm, a budget a standard, a performance or stock level and so on.

Types of Control Systems

There are basically two types of control system: the open loop system and the closed loop control systems.

# Open loop control system



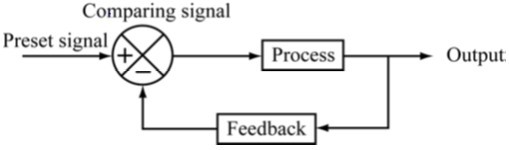
This is a simple open loop control system. Its operation is very simple, when an input signal directs the control element to respond, an output will be produced. Examples of the open loop control systems include washing machines, light switches, gas ovens, etc.

The drawback of an open loop control system is that it is incapable of making automatic adjustments. Even when the magnitude of the output is too big or too small, the system will not make the appropriate adjustments. For this reason, an open loop control system is not suitable for use as a complex control system. Sometimes it may even require monitoring and response from the user.

# Closed loop control system

Sometimes, we may use the output of the control system to adjust the input signal. This is called feedback. Feedback is a special feature of a closed loop control system. A closed loop control system compares the output with the expected result or command status, and then it takes appropriate control actions to adjust the input signal. Therefore, a closed loop system is always equipped with a sensor, which is used to monitor the output and compare it with the expected result.

The diagram shows a simple closed loop system. The output signal is fed back to the input to produce a new output. A well-design system can often increase the accuracy of the output.



Feedback

This is the gathering of information on past performance from the output of a system, department or process and using it to govern future performance by adjusting the input size of the system.

Feedback can be divided into positive feedback and negative feedback.

1. *Positive Feedback*

This causes a system to amplify an adjustment or an action. It acts in the same direction as the measured deviation i.e. this reinforces the way the system is moving and if thought to be beneficial.

If an advertisement increased the sales further advertisements may be considered.

1. *Negative Feedback*

This is feedback seeking fluctuation around a norm or a standard. The corrective action is on the opposite side of the deviation e.g. production quantities below the plan may require an increase in labor.

One advantage of using the closed loop control system is that it is able to adjust its output automatically by feeding the output signal back to the input.

In a closed loop control system, the controlled variable (output) of the system is sensed

at every instant of time, feedback and compared with the desired input resulting in an error signal. This error signal directs the control elements in the system to do the necessary corrective action such that the output of the system is obtained as desired.

The feedback control system takes into account the disturbances also and makes the corrective action.

These control systems are accurate, stable and less affected by noise. But these control systems are sophisticated and hence costly. They are also complicated to design for stability, give oscillatory response and feedback brings down the overall gain of the control system

Feedback Loops

High level controller

Sensor management

Adjust

System Being Controller

Low-level Controller

Standard

Effector

Comparator

System inputs

e.g. labor finances

System output

1. SENSOR- This is the measuring and recording device for example automatic metering or some kind of paper work.
2. COMPARATOR – This is he means by which comparisons of actual results and the plan are achieved

e.g. A clerk or a computer program.

1. EFFECTOR – This could be a manager or supervisor acting on the report to make adjustments.

The procedure outlined above, i.e. input - process - output - monitor and compare - adjustment, requires what is known as a feedback control loop and such a loop is a common feature of many aspects of MIS, for example, stock control, budgetary control, production control and so on. It will be realized that the basic system described is relatively mechanistic and is therefore not necessarily suitable for all facets of the organization’s activities.

Feed Forward

Where a self-regulating feedback system is not able to control a process adequately it may be feasible to use feed forward. This is where monitoring at some early stage of a system or process may indicate that an adjustment should be made at a later stage of the process, prior to the final output. Feed forward is not an automatic process and requires management intervention for it to operate successfully and, consequently, it does not have the degree of 'automatic' control inherent in a feedback system.

Timing of Control

Control is most effective when the time rank between the output and the corrective action is minimal. The speed of control is influenced by organization structure and the reporting period. Managers may be unable to effect control due to the following reasons:-

1. The subject covered is outside manager’s control.
2. The information comes too late for effective action to be taken.
3. Insufficient details are provided.
4. The information that is provided is in a form that isn’t understood.

PLANNING

Information Systems and Organizational Structure

An Information System is a composition of people, procedures and equipment that provide information to the management to be able to make appropriate decisions. This can now be illustrated in the following pyramid.

Strategic Le-vel Support long-rays planning activities of semi level

EIS or

ESS

Tactical level (DSS, MIS)

Knowledge level (KSWS, OAS)

Operational level (TPS)

management from both environment and internally.

* Maintain changes in external environment with existing information and activities
* Support maintaining and decision making and administrative activities of middle level management
  + Support knowledge and data worker in organization
  + Help business to integrate new knowledge and control the flow of paper work in the organization.
    - Monitor elementary activities and transaction of the organization.
    - Answer routine questions and track flow of information in organization
    - Must be current and accurate.

1. Operational System

They monitor elementary activities and transactions of the organization e.g. sales, receipts, cash deposits, payroll and flow of materials in the factory.

The main purpose of these systems is to answer routine questions and track the flow of information in the organization. To answer this information must be available, it should be current and accurate e.g. a bank deposit query from a bank A.T.M.

1. Knowledge Level Systems

This supports knowledge and data workers in the organization. It may help businesses to integrate new knowledge and to control the flow of paper work in the organization.

1. Management /Tactical Level Systems

They support the monitoring, controlling and decision making and administrative activities of middle level managers e.g. they may be required to compare the current data with the past. These systems produce reports rather than instant information on

the operations. They may focus on the less structures decisions for which information requirements aren’t always clear and attempt to answer the ‘what if’ questions.

1. Strategic Level Systems

These support the long-range planning activities of the senior level management both from the environment and internally. Their main concern is maintaining changes in the external environment with the existing information and activities.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | **Level of management** | **Typical responsibility** | **Planning Horizon** | **Decision type** | **Accuracy** | **Source of information** |
| 1. | Strategic | Setting Organization goals, long-term plans and policies | Normacy takes period of 5-10 years depending on the project | Non-structured & subject to many changes | Very low Accuracy | Mostly from outside the organization and internal |
| 2. | Tactical | Setting and monitoring org. budgets, meeting the strategic goals & developing operations objectives and policies | Usually takes 1 to 3 years | Semi-structured and based on the managerial experience | Reasonable accuracy e.g. when setting budgets and targets | A mixture of internal and external sources  e.g. what is happening to the competitors. |
| 3. | Operational | Effective use of existing facilities and resources.  Concerned with day- to-day running of the  organization | Usually a week or less day to day | Structures and hardly require human intervention. | High accuracy required e.g. tracking the cost to a cent | Captured from source documents. |

Types of Information Systems

ESS

Strategic level (long-term planning)

Tactical level (planning & control)

MIS & DSS

KWS & OAS

Knowledge level (designing new

products)

**34 |** P a g e

TPS

Operational levelJ (.kGeeApTinAgC H A

track of daily activities)

TRANSACTIONS PROCESSING SYSTEMS (TPS)

These are the basic business systems serving the operational level of the organization. A TPS is a computerized system that performs and records the daily routine transactions necessary to conduct the business e.g. sales order entry, invoicing, hotel bookings, payroll and shipping data. At this level tasks, resource and goals are predefined and are highly structured e.g. the products that are out of stock and the slow moving stock.

TPS are central to an organization such that if there is a failure it can bring the organization to a standard still. The information inputs for the TPS are in the form of transactions and events. Processing involves sorting, listing, merging and updating.

The information output are detailed reports which are given to the operational staffs and supervisors.

It provides the input data for many other systems. T.P.S is critical to the success of any organization since they support the law level operations such as purchasing o raw materials. Billing customers and preparing the payroll etc.

The objectives of T.P.S are:

* 1. To provide all information needed by law or by the organization policy to keep the business running properly and efficiency.
  2. Provide timely documents and reports.
  3. Increase the competitiveness of the organization.
  4. Provide necessary data for tactical and strategic systems e.g. the DSS.
  5. To assure accuracy and integration of data and information.
  6. To safeguard assets and security of information.

NB: T.P.S is the most likely candidates for re-engineering and usually yield the most tangible benefits of I.T. investments.

Major characteristics of T.P.S

1. This involves large amounts of data to be processed. Sources of this data are mostly internal.
2. T.P.S process information regularly e.g. Daily or Weekly.
3. Due to the voluminous information that is processed a higher storage capacity is required.
4. Due to these high volumes, high processing speeds are needed.
5. T.P.S systems monitor and collect current and past data.
6. The inputs and the outputs are highly structured (programmable).
7. A high level of details is usually observed in the input.
8. This system requires a high level of accuracy, data integrity and security.

Activities and methods of TPS

There are 2 transactions processing modes namely;

#### Batch processing

Business transactions are corrected as they occur and are accumulated over a period of time and prepared for input as a single unit or batch. This is normally processed periodically e.g. monthly, examples include the payroll and the general ledger.

#### Interactive /Real-Time processing

The transactions data are processes immediately without delay e.g. inventory systems, ticketing systems, reservation systems and A.T.Ms.

T.P.S can also be based on a client /server and internet technologies. Innovations such as online transactions processing (OLTP) can serve many people by allowing suppliers to enter the TPS and look at the inventory level.

Types of TPS (FUNCTIONAL TPS)

#### Order processing

This is necessary to ensure that the customer orders are filled in a timely manner and that sufficient finished goods are always available.

Sales people in many organizations will enter order from client sites using portable wireless computers.

#### Inventory /Stock Control

A manufacturing firm will have several inventories such as raw materials, work in progress (W.I.P) and finished goods. These could also contain maintenance parts. The inventory T.P.S monitors stock going out or coming in to the organization via its various warehouses and plants.

#### Accounts Receivable /sales ledger or Debtor ledger

This manages the cash flow of the company by keeping track of the money owned on changes for the goods sold. The system updates records and raises an invoice

/statement regularly.

#### Account payable /purchase ledger or creditor ledger

Keeps track of money owed to company by various creditors or suppliers.

#### Payroll

This monitors the salaries and has the primary output as checks and pay slips to be distributed to the employees and provides a payroll register which is a summary of all the transactions.

#### Human Resources

This system gives the information about the employees for personnel planning and government reporting and also the management of the company to benefit from other programmes. These include information on the employee’s e.g. net pay, deductions e.t.c.

#### General ledger

This is a record of the monetary transactions e.g. payment to suppliers, receipts from customers and payments to employees. It will give financial statements such as the trading and profit and loss account, the trial balance and the balance sheet.

Knowledge Work and Office Automation System (KWS & OAS)

KWS are the systems that secure the knowledge workers. They do assist the knowledge workers in the creation and integration of new knowledge in the organization. The knowledge workers are the people who have the responsibility of creating or finding new sources of information. This includes engineer doctors, scientist and programmers. Processing involves modeling and simulations. The information outputs are models and graphics for professional and technical staff.

Office Automation system are computer system this include word processors, emails and scheduling system, designed to increase the productivity of the data workers in the office.

Data workers have less formal qualifications and tend to process information a lot is already available. This includes secretariat, accounts, filling clerks or managers whose jobs include the use, manipulation or dissemination of information.

Information inputs are documents and schedule – processing includes, delegation scheduling and communication. The outputs are clerical schedules and the mails for clerical workers.

Management Information System (MIS).

They are information system at the management level that assists in the planning, controlling and decision making. They are oriented towards internal rather than external events. To a high degree they depend on the information from the T.P.S. They summarize and report on the basic operations of the company.

They are used for comparing performance i.e. they give an analysis of the past and present.

Information inputs are summary transaction data high volume data and simple models.

The processing includes routine reporting, simple modeling and low level analysis. The outputs are summary and exceptional reports for middle managers.

**Adhoc** reports are reports that aren’t available immediately but can easily be generated by specifying certain parameters at any given time.

**Exceptional reports** are the reports that give a deviation in controls within a certain system e.g. payroll where employee’s way is listed those that have negative salary.

MANAGEMENT REPORTING SYSTEMS (M.R.S)

A M.R.S is a computer system capable of integrating data from many sources to provide data and information. They are useful in supporting operations, management and decision making in organization. MRS extracts data processes and product meaningful results. The main aim of an MRS is to identify potential problems on areas of opportunity for improvement.

##### Characteristics of MRS system

1. It’s oriented towards reporting on the past and the present rather than projecting the future hence the need for warehouses.
2. This is usually designed by MIS professionals rather than end users over extensive time periods.
3. This is built for situations in which information requirements are reasonably well known and are expected to remain stable.
4. Have limited analytical capabilities.
5. Generally report on internal company operations.
6. Present information in standard formats.
7. Provide feedback path in target /budget vs. actual enabling management control.

#### A detailed report.

Such a report is frequently used to verify that the transactions have been entered and processes corrected. Such a report is however long and not good for reporting trends or problems (progress).

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Order no. | Custom er code | Sales person | Shipme nt date | Qty | Item | Amoun t |

#### Summary Report

Brings together one or more related transactions and shows the total results. Whereas the detailed report would give all the sales made in the company within a specified time period, the summary report will indicate the sales amount for all the personnel in the sales department within the specified period.

#### Exceptional Reports

These reports display data only about exceptional conditions. It records abnormal cases e.g. customers who have exceeded their credit limit but are receiving their goods or products and that their current credit limit is negative according to the system.

Management reports can be produced on 3 occasions i.e.

* 1. Either periodic /schedule

They are prepared on a regulator basis i.e. weekly or quarterly.

* 1. Exceptional

They are produced whenever certain conditions are met or not met e.g. products below the re-order level.

* 1. On demand or adhoc

They are prepared whenever they are required by the end user.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| No. | Types of report | Timing or trigger | Exception | On demand |
| 1. | Detailed | Daily input list of sales | Individual sales over 10,000 | Sales by sales person by product |
| 2. | Summary | Daily total sales and Daily monthly sales | Sales people exceeding 5,000 | Total sales  by sales person and total sales by customer |
| 3. | Exceptional | Daily error limit |  |  |

ESS

MIS

DSS

KWS

or DAS

TPS

Controls of Transaction Processes

The audit trail tracks document numbers, transaction references and the respective dates and times. This is to ensure the accuracy integrity and security needed by the

T.P.S needed.

Most fraudulent transactions are performed at the transactional, operational level.

#### Several controls of the T.P.S include;

1. **Source document control.**
   1. We use pre-numbered documents to enable proper accounting.
   2. We make use of batch and harsh totals.
   3. We record all documents produced by the by-products of the transaction.

#### Information processing control.

This is designed to ensure that information services conform to the organizations objectives and policies and that information produced is complete and correct e.g. verification and validation.

#### Information systems management and control.

These are responsible for the development and operations of all information systems.

* 1. This is to make sure that the maintenance of systems is undertaken by qualified staff through selection, training and evaluation.
  2. This ensures that appropriate hardware and software are purchased.
  3. This is to have the scheduling of work of the development staff so as to monitor progress.
  4. To ensure control over the database design, authorization and access.
  5. To establish and enforce the guidelines and standards so as to meet end-user objectives.

Decision Support Systems

Information systems for the management level that combine data and sophisticated analytical models on data analysis tools to support semi-structured decision making.

* They are used where decision are unique or rapidly changing and aren’t easily specified in advance.
* They use internal information from TPS and MIS and also bring information from external services
* These systems have more analytical power than any other system and have an interface that is interactive and user friendly.
* The information inputs are low volume data or massive databases which have been optimized for data analysis and analytical modeling.
* Processing involves interactive simulations and analysis and the outputs are special reports, decision analysis and responses to queries

Characteristics of decision support system

1. They are developed with the participation of individual managers or a group of managers to support a range of decisions. Some decision support system are simple and may be developed with a spreadsheet package e.g. Ms Excel or Lotus 123.
2. DSS are built to be modified so as to adapt to the user requirements.
3. DSS directly support the decision making process.
4. They have the strengths of projecting possible future situations during the planning process using the “WHAT IF” mode e.g. what if we increase the advertising expenditure by 5% and the “GOAL SEEKING” mode e.g. what would it take in terms of input factors to achieve a particular performance?
5. It has extensive analytical capabilities using logical and mathematical manipulation of data.
6. It combines one internal and the external information so as to build its own databases.
7. It has a graphic facility to portray the decision situation rather than the tabular display or data.

COMPONENTS OF A D.S.S

Data management systems

Dialogue management

Model management system

system

User

Creator, maintenance and use of models

Retrieval Extraction of data from Internal and External sources

Menus, icons, natural language and graphics

Human Decision Maker

Data Management System (SUB-SYSTEM)

It relies on a variety of internal and external databases. The extraction procedures are specified by a specialist rather than an end-user paying attention to data consistency across multiple support systems.

Model Management System

A model is an abstract representation that illustrates the components or relationships of a given situation. Models can be physical e.g. an airplane model. It can be mathematical

e.g. an equation or it can be verbal e.g. the description of a procedure for writing an order. It may also be statistical e.g. the mean, median, mode, the variance and the standard deviation or they can be optimization models, forecasting or sensitivity analysis model asking the WHAT IF questions to determine the impact of changes in one or more factors or outcomes.

The power of a D.S.S. relies on the user’s ability to apply quantitative and mathematical models to data or even statistical. These may include:-

1. Market responses models – this show how sales depends on factors such as price and promotion.
2. Simulation models – this generates input values randomly from probability distribution e.g. to determine the number of operators or cashiers needed.
3. Optimization models – these are developed by management scientists for the allocation of resources to maximize profits or minimize costs and time. They are usually based on linear programming.

Dialogue Management System (SUB-SYSTEM)

Since the D.S.S has the ability to apply models to large volumes of data from a variety of sources, the advantage of a D.S.S is that the user finally and has a flexible interface between the human decision maker and the computer system. These sub-systems support multiple forms of input and output. A.I has improved on this by adding the ability to specify what is required in a subset of national language on activate the system by voice. The windows capability enables the user to maintain several activities at the same time. Extensive computer graphics are also utilized and the kind of dialogue will take the following form:-

* 1. Who is the biggest?
  2. How do circumstances change over a given time?
  3. How will one fact predict another?
  4. What is typical or exceptional?

Classifications of DSS

They can be classified by the manager’s level i.e. operational tactical or functional area

e.g. marketing, finance and personal among others.

1. Data Access System

They provide a user friendly interface and adhoc access to the database. This is similar to what is offered by database management through a quarry language.

These systems are meant for operational control.

1. Data Analysis System

They help to analyze historical and current data either on demand or periodically e.g. comparing the performance with that of the competitors.

1. Forecast-oriented Data Analysis systems

They assist in developing product plans including market segment forecast, sales forecast and analysis of competitive actions. Their operation is based on access to a variety of internal and external sources, marketing and product databases including a series of historical data.

1. Systems based on Accounting Models

They consider alternative options for planning purposes based on accounting deviations and relationships. They produce estimated income statement and balance sheet and they use the “what if” mode of alternatives.

1. Systems based on representation models

They show the dependence between a controllable variable e.g. the price of a produce and an outcome such as sales. And they use simulation models to yield probabilistic results.

1. Systems based on optimization models.

They are used by management scientists to determine optimal allocation of resources or the best possible schedule e.g. the use of linear programming to maximize an objective such as profit.

1. Systems with suggestion models.

These actually suggest decision rather than evaluating alternatives. They are used in narrow domains of knowledge and are based on the expert system technology e.g. suggesting a product price or a production volume.

They have the same capabilities and limitations like expert systems. Data oriented decision support systems support easier places of decision making i.e. the intelligence, the decision and the choice places are supported by model oriented DSS.

When to use decision support systems

* 1. When there is vast amount of data to be processed.
  2. When there is a large amount of computation or data manipulation that have complex interrelationships.
  3. When there is an analysis of stages requiring the “WHAT IF” approach.
  4. When human judgment is required.
  5. When communication is required and several people contributing some special expertise are involved.
  6. When the decision maker is comfortable with the use of quantitative methods to enhance decision making.

The Building of the DSS

D.S.S acquisition depends on the technology applied and the nature of the decision task that need support. D.S.S technologies include;-

1. Specific D.S.S – This is the actual system that a manager works with during the decision process. It’s built using D.S.S generators or tools.
2. D.S.S Generators – This is a software package that provides capabilities for building a specific D.S.S rapidly and easily. The common characteristics are that much of the processing and data accessing functionality is already programmed into to generator. Examples of generators are express, PC Express, Focus, Nomad 2 Lotus 1, 2, 3 and Ms Excel.
3. D.S.S. Tools – This programming language with good capabilities for accessing arrays of data e.g. APL, a plain spreadsheet, a statistical package SPSS or SAS or a DBMS with a Query facility which can be used as a building block to contract a

D.S.S generator or A specific D.S.S.

“Who builds a D.S.S?”

This is done by the end users and the MIS professionals. It involves the following groups of people:-

1. The manager is the end-user and the MIS professionals. It involves the following groups of people.
   1. The manager is the end-user of a specific DSS on a knowledge worker who actually employs the system to make decisions.
   2. The intermediary who assist the manager to learn the system.
   3. A DSS builder who employs a generator to build a specific DSS for the given end-user. He must be familiar with the business problems and the capabilities of the generator.
   4. The technical support specialists who install and maintains various modules of the generator package as needed. He ensures that there are linkages to other element such as databases, personal workstation and the network.
   5. A tool smith who develops the building blocks employed by the generator.

Comparison of DSS and MIS

|  |  |  |
| --- | --- | --- |
|  | **DSS** | **MIS** |
| 1. | A DSS is more targeted. | An MIS is more widely spread |
| 2. | They focus on specific decisions | They use routine flows of data to assist in the general control. |
| 3. | They are aimed at all managers | They are largely dominated by professional e.g. accountants and HR experts. |
| 4. | They are continuously interactive | They follow a particular system development methodology. |

#### Methods of DSS Development

1. Quick-hit approach

Most DSS are built for personal use of a decision maker using a DSS system such as spreadsheet package with templates. This method faces the same risks as those of end-user computing e.g. lack of maintainability.

1. Traditional life cycle development.

This involves detailed system planning, analysis, design, coding, testing and implementing. This method is good for complex D.S.S. and D.S.S generator.

1. Iterative development (prototyping).

In DSS development users may not know what they what from the system. A prototype, which is a simple initial version, is used to experiment with and learn about the desired features of the system. This method of development relies on the creation of such a prototype and its progressive refinement. The simple version consist of 3 elements i.e. the Database. The dialogue and the model sub systems.

DSS is ready for use

Are current

requirements met?

Yes

No

Prototype /DSS modification

Develop a Prototype

Prototype /DSS Evaluation

Validation and documentation of DSS

Development

Geographical Information System (G.I.S)

This is a special category of D.S.S that can handle and analyze data for planning and decision making using digitized maps. The software can assemble, store, manipulate, and display geographically referenced information, time data to points, lines and areas of a map.

They support decisions that require knowledge about the geographical distribution of people or other resources which are useful in planning e.g.

* 1. Where to locate ATM in towns and cities.
  2. Where to locate petrol stations.
  3. To know market and know where to emphasis in marketing.
  4. Depots and distributions points.

Web-Based Decisions Support System

These are systems that support decision making by providing online access to various databases and information pools for the purposes of software analysis “handouts later”

GROUP DSS (GDSS)

It’s an interactive computer based system to facilitate the solutions of unstructured problems by a set of decision makers, working together as a group. It includes web based tools for radio conferencing and E-meetings.

They help to share information, exchange ideas and export alternative solutions with the use of models and data, voting and consensus.

The settings for a DSS range from a face to face meeting or an executive planning group who are widely dispensed e.g. Insurance company agents discussing the possibility of new rates.

A typical GDSS should include the following:-

1. HARDWARE:- Conferences facility with a room, facilitates and electronic hardware such as electronic display boards, audiovisual equipment, computer and networking equipment.
2. PEOPLE – Needs participants, a trained facilitator and the staff that support the hardware and software.
3. SOFTWARE TOOLS – such as;
   1. Electronic questionnaires – assist the organizers in planning and identifying areas of concern from the participants.
   2. Electronic brain-storming tools – they allow individuals to simultaneously and anonymously contribute ideas and eventually choose the most appropriate.
   3. Idea organizer – facilitate the organized integration and synthesis of ideas generated during brain-storming.
   4. Tools for voting or setting priorities – help in simple voting and ranking the decision.
   5. Group Dictionaries – document group agreement in the definition of words and terms used in a project.

#### Characteristics of GDSS

1. They have the 3 major components i.e. databases, models and dialogue sub- system and communication component or a local area network or WAN.
2. It has a complete decision room equipped for group effort e.g. a large common screen display.
3. The participating members of the group remain anonymous.
4. Have the ability to obtain protocols or rules of accessing ideas for later analysis.

#### How GDSS Can Enhance Group Decision Making

1. Improves the pre-planning process.
2. Increases the participation of members as they contribute simultaneously.
3. Due to fact that members are anonymous the meeting atmosphere is conducive.
4. Its free of criticism due to the reduction of unproductive inter-personal conflicts.
5. Idea organization and evaluation are used to modify the results.
6. Documentation of meeting and preservation of organizational memory.
7. Access to external information.

Executive Information System /Executive Support System (E.S.S)

These are information system at the strategic level to address the non-structured decision making through advanced graphics and communication. It combines internal and external data to create a generalized computing and communications environment and thereby assist the senior executives monitor the organization performance, tracks the activities of competitors, spot problems, identity opportunities and focus trends.

#### ROLE OF E.I.S:

1. Executive are bound to receive fixed formats of reports e.g. weekly or monthly which can easily lead to data over-load.

EIS solves the problem by supplying easy to use desktop analytical tools and online data displays. These tools help to drill down the information i.e. being able to more from summarizes to the details.

1. Provide managers with minimum computers experience with a common user friendly software tool e.g. a spreadsheet for analytical purposes.
2. To solve the limitation of having to use data from systems designed for different purposes e.g. data from a sales TPS should provide essential information for marketing purposes.
3. Provide managers with external data e.g. current stock market news, industry trends and competitor information. These data can be illustrated as follows:-

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| No. | Area | Historica l 2017 | Curren t 2018 | Forecas t 2019 |
| 1. | Overall performance  Total sales Total costs |    |    |    |
| 2. | Summarized financial data  - Sales by  division, by product, by customer cost by category, product cash flow |     X |      |      |
| 3. | External data  Economic trends |  |  |  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Industry trends Competitive analysis Consumer analysis |  |      |      |
| 4. | Personnel  Performance data Availability of key personnel |  |    |    |
| 5. | Project status and promotional plans |  |  |  |

Characteristics of E.I.S

* + They provide immediate and easy access to information reflecting the key success factors of the company and its subsidiaries.
  + They use user-seductive interface e.g. color graphics and video which help the user to grasp trends at a glance.
  + Provide access to a variety of databases both from internal and external sources through a uniform standard interface.
  + Provide both the current status and the projection of data.
  + Allow easy tailoring to the preferences of a particular user or group of users e.g. Windows XP.
  + They have the capabilities of drilling down the data.
  + They create a generalized computing and communication environment rather than providing any fixed application of a specific capability.
  + They are designed to incorporate data about external event. e.g. new tax data on competitors but also use summarized information from the DSS and the MIS.
  + They filter/compress and track critical data emphasizing the reduction of time and effort required to obtain executive information.
  + Information is the average of internal and external data which are highly summarized.
  + The processing involves the production of graphics and simulations whereas the information outputs are projections and responses to the queries of the senior managers.

Developing E.I.S

Executive need change rapidly and so high level executive expect success the first time. This implies that the developers of E.I.S must consider the following:-

1. Using prototyping techniques to develop a user-friendly system.
2. Including a facility for environmental scanning that uses internal and external data to detect problems in organizational environment, strategic trends and opportunities.
3. Developing a system that is going to neutralize resistance that is likely to occur due to the E.I.S potential of giving top executives the capabilities of examining manager’s work without their knowledge.
4. Developing a system whose benefits can be quantified after it becomes operational. This is because there is a problem of justifying the cost of a system that primarily supports unstructured work.

Elements of a successful E.I.S

1. Standard Reports – the ability to navigate easily via large amounts of data. This can include text, reports, numerical table and projects status reports e.g. Gantt Charts, PERT and network analysis.
2. Drill-down capabilities:-
3. Short term issues: Ability to set and delete issues very quickly without the help of

I.T staff.

1. Exceptional reporting capabilities.
2. Executive briefing: Manager should be able to select screens of data, text or graphs and download them to a standard workstation for later review and preservation at meetings.
3. External data – Most businesses have sources of specific industry data that is important for the operation of the data. The E.I.S is able to filter this key information.
4. News – News delivered electronically should be more current and focused that those via the print media.
5. Data analysis – This should include abroad range of functionalities from a simple calculation to sophisticated modeling software.
6. Executive mail – This allows managers to incorporate Emails and attachments with minimum keyboard interactions.
7. Time management – The time management component of an E.I.S should provide a calendar and a suspense file for keeping track of important dates and timers.
8. Data retrieval – It should provide access to corporate files and databases which are linked to public databases.

Benefits associated with E.I.S

1. Help to save the staff and executive time.
2. Help executive improve their understanding of the company and its environment.
3. They eliminate communication bottlenecks between the staffs, the management and the executives which can show down the decision making process.
4. They provide executive with summarized and custom tailored data.
5. Their ability to analyze, compare and highlight trends ensure clearer and up to- date information.
6. Flexibility in their use in that they put the data and the tool in the hands of executives without addressing specific problems or imposing solutions.

Problems Associated With E.I.S

1. The executive success failure will have a major impact on organization.
2. Line and staff managers are uncomfortable with executive access to detailed operational data especially if they have no time to do their own analysis before the executive can access the data.

This may lead to situations where some data may be withheld from the databases.

1. Using an E.I.S may not be compatible with the management styles of making executives used to working via others.

What is decision making?

Decision making is an integral part of management and occurs in every function and at all levels. Naturally the type of decisions taken varies enormously but all decision makers have to go through a similar process. All of them must decide by some means to choose the outcome or outcomes which are considered necessary or desirable to them and to do so after some form of appraisal of the situation.

H.A. Simon, a leading authority on management decision making, considers that decision making comprises four principal phases: finding occasions for making decisions, finding possible courses of action (i.e. alternatives), choosing among courses of action, and evaluating past choices.

Figure shows a summary of these phases using Simon’s terminology

Phase 1

Intelligenc

e Design

Searching the environment for conditions calling for decisions.

Phase 2

Phase 3 Choice

Phase 4 Review

Inventing, developing and analyzing possible courses of action. This involves processes to understand the problem, to generate

solutions and the testing of solution for feasibility.

Selecting an alternative or course of action from those

available. A choice is made and implemented. Assessing past choices.

It is important to realize that although there is a general flow from intelligence to design to choice to review, at any time there could be a return to an earlier phase. For example, a decision maker in the choice phase, who finds no suitable alternative among those currently available, would return to the design phase to develop more alternatives. Decision making is an iterative process and although it is useful to separate out the various phases

in order to discuss them, very few decisions are taken in this neat, logical sequence. There is feedback/ interrelationships between decisions; there is flair, intuition, judgment and creativity.

Decision making is based on information. Information is the trigger to knowing there is a problem. Information is needed to define and structure the problem, to explore and choose between the alternative solutions and to review the effects of the implemented choice.

#### Simons model of decision making

1. Is there a problem?
2. What are the alternatives?
3. Which should you choose?

Intelligent

Design

Choice

Individuals collect information to identify problems or opportunities. This requires exceptional reporting and uses MRS & TPS.

As you design you may make use of simulation and prototyping which utilizes DSS and KWS

This require “what if” simulation and uses DSS and other large models.

1. Is the choice working

Implementation

The decision is put into effect and reports on progress this requires graphics and charts.

#### Programmed and non-programmed decisions

Simon classified decisions into two categories according to the extent that the process of decision making can be pre-planned. The categories are programmed and non-programmed, as follows;

#### Programmed decisions

Characteristics: repetitive, routine, known decision rules or procedures, often automated, usually involve 'things' rather than people, can be delegated to low levels in the organization. Examples: inventory control decisions, machine loading decisions, scheduling.

#### Non-programmed decisions

Characteristics: novel, non-routine, decision rules not known, high degree of uncertainty, cannot be delegated to low levels, may involve 'things' but always involve people. Examples: acquisitions, mergers, launching new products, personnel appointments.

#### Semi-structured decisions.

These decisions are partly programmable and partly rely on decision maker judgment.

Note: alternative terms for these two categories are *structured* and *unstructured*.

The two categories should be thought of as the extreme ends of a range of decision types with many decisions containing elements of both categories. The terms programmed and non-programmed are not related to computer processing. They refer to the nature of the decision process and to the extent that the process can be pre-planned.

There is some relationship between the level of management and the decision type: broadly more programmed decisions at lower levels and more unstructured decisions at higher levels, but this is not an absolute rule. Some high level decisions contain structured elements, an example being a costly plant replacement decision which is likely to be taken at the highest level and for which decision rules are available using replacement analysis and investment appraisal techniques.

#### Levels of decision making

Decision making takes place at each level of management in an organization although there are markedly different characteristics at each level. Each level has substantially different information requirements. The figure below summarizes the main characteristics and information requirements of the various levels.

**Management level Decision characteristics Information characteristics**

Strategic

Long time horizons, large-scale resources, much creativity and judgment, usually unstructured, problems difficult to define, infrequent, much uncertainty

Largely external, informal sources important, forward looking, qualitative information important, precision unimportant, instant access not vital, wide ranging, incomplete

Tactical

Operational

Repetitive, short time scale, small-scale resources, usually structured, clear objectives and decision rules, little or no discretion

Largely internal, mainly historical, detailed, often quantitative, high precision, instant availability often critical, narrow in scope, comprehensive

The tactical level of management occupies an intermediate position between the two extremes with some of the characteristics of both. Much of the development of formal aids to decision making, such as,, for example, optimizing models has been directed at the operational and tactical levels of management. At the strategic level,

decision making is much more dependent on human factors and judgment. Such decision making is based on guided trial and error and because of uncertainty and ambiguities, all possibilities cannot be explored. This type of decision making is known as heuristic and is based on rules of thumb rather than explicit decision rules.

Figure below gives examples of decision making at the three levels with typical information requirements. In practice, decisions should be taken at the level where they are most effective.

**Managemen**

**t level**

Strategic

**Decision examples**

**Information requirements**

Mergers and acquisitions, new product planning, capital investments, financial

structuring.

Pricing, capacity planning,

budget preparation,

purchasing contracts. Production scheduling,

maintenance, reordering, credit approval.

Market and economic forecasts, political and social trends, legislative, environmental and

technological constraints and opportunities

Tactical

Operational

Cost and sales analyses, performance measures,

summaries of operations/production, budget/actual comparisons, etc.

Sales orders, production requirements, performance measures, customer credit status,

deliveries, dispatches, etc.

Peter Drucker says decisions should be made at the lowest possible level which accords with their nature, and as close to the scene of action as possible. They should always be taken at the level which ensures none of the activities and objectives affected is forgotten.

There is increasing evidence that many decisions are being taken at lower levels in the hierarchy. Authority to take decisions is being delegated down the line/ especially in modern service industries. This process is called empowerment and means that the organization is able to answer queries and take a variety of decisions more quickly thus providing a better and more flexible service. Empowerment is also one of the reasons why some middle management jobs are disappearing.

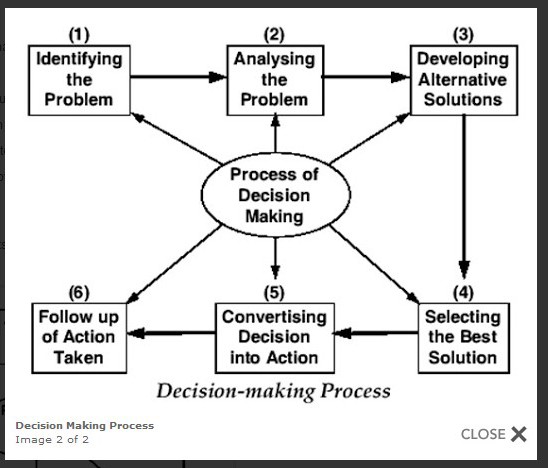
## Decision making cycle

#### Steps Involved 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 six steps:

1. Defining / Identifying the managerial problem,
2. Analyzing the problem,
3. Developing alternative solutions,
4. Selecting the best solution out of the available alternatives,
5. Converting the decision into action, and
6. Ensuring feedback for follow-up.



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.
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:
   * Futurity of the decision,
   * The scope of its impact,
   * Number of qualitative considerations involved, and
   * Uniqueness of the decision.
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.
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.
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.
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.
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.