UNIT – IV

Decision Support system (DSS)

The decision support system is an interactive computer-based system, which helps decision-makers to utilize data and models to solve unstructured problems. The DSS is designed to facilitate the solutions of problem of structured than those of MIS and TPS which are less structured. The nature of decision taken by DSS is of non-routine and less structured. The DSS is a collection of data and data processing tools used to creatively manipulate data to answer unknown and often unexpected questions. DSS is a coordinated collection off data, system, tools and techniques with the necessary, S/W and computer H/w through which an organization gathers and interprets relevant information from the business and environment and turns into information that acted upon. In the end, we can say that- DSS aims at supporting the decision maker by providing the information with the aid of quantitative techniques.

**Attributes of a DSS**

Adaptability and flexibility

High level of Interactivity

Ease of use Efficiency and effectiveness

Complete control by decision-makers.

Ease of development

Extendibility

Support for modelling and analysis

Support for data access

Standalone, integrated and Web-based

**Characteristics of a DSS**

Support for decision makers in semi structured and unstructured problems.

Support for managers at various managerial levels, ranging from top executive to line managers. Support for individuals and groups. Less structured problems often require the involvement of several individuals from different departments and organization level.

Support for interdependent or sequential decisions.

Support for intelligence, design, choice, and implementation.

Support for variety of decision processes and styles DSSs are adaptive over time.

**Benefits of DSS**

Improves efficiency and speed of decision-making activities

Increases the control, competitiveness and capability of futuristic decision making of the organization

Facilitates interpersonal communication

Encourages learning or training

Since it is mostly used in non-programmed decisions, it reveals new approaches and sets up new evidences for an unusual decision

Helps automate managerial processes

**Components of a DSS**

Following are the components of the Decision Support System:

Database Management System (DBMS): To solve a problem the necessary data may come from internal or external database. In an organization, internal data are generated by a system such as TPS and MIS. External data come from a variety of sources such as newspapers, online data services, databases (financial, marketing, human resources).

Model Management system: It stores and accesses models that managers use to make decisions. Such models are used for designing manufacturing facility, analyzing the financial health of an organization. Forecasting demand of a product or service etc.

Support Tools: Support tools like online help; pull down menus, user interfaces, graphical analysis, error correction mechanism, facilitates the user interactions with the system.

**The tools of decision support systems**

Decision support tools may involve the following: -

(a) Material requirement planning (MRP) – MRP is a method for ordering and maintaining materials in stock. It is a systematic approach to identify cost-beneficial ways of storing materials.

(b) Linear programming – Linear programming assists in solving problems which involves allocation off limited resources and evaluation of alternatives to achieve objectives.

(c) Queuing theory – Queuing theory is used in planning the activities of the organization to determine economically beneficial queues e.g. production of goods.

(d) Descriptive statistics- Descriptive statistics are used to estimate parameter and the dispersion of values associated with that parameter. These estimates are made for the various critical environmental factors to plan the day-to-day operations of the organizations.

(e) Correlation analysis- Correlation analysis is made to calculate relationship between values for particular parameters, such parameters value describing current conditions.

(f) Variance analysis- Variance analysis is used to describe variance between two or more variables. (g) Network analysis- Network analysis is a pictorial tool for identifying and sequencing tasks. Those analysis help manager in controlling tasks necessary for successful operation of organization.

(h) Transportation problems- Transportation problems are used for planning and distribution of various facilities and resources.

(i) Maximum flow or distance – Program flow or distance is a tool for identifying the most economically beneficial flow through, or distances between, particular objects, this facilitates in determining the most preferred flow of goods or services through an object for which the organization must conduct business.

(j) Dynamic programming – Dynamic programming is a tool to enable that appropriate course of action and top-level management are being followed by managers at operational level.

(k) Regression analysis- The regression analysis can be used to estimate particular values on the basis of known values for variables. It may be used to estimate the value of known variables which may influence plans for implementing the decision of top-level managers.

(l) Markov processes – Markov processes are tools used to determine global associated with the occurrences of the related to changing probabilities of particular object. These global probabilities can then be used to determine more appropriate courses of action for the organization.

**Top Management Systems**

1. The basic rule for designing an information system is that the proposed output of the system for any managerial level should be commensurate with the responsibilities and decisions made at that level because the system of information flow provides the underpinning to effective management.
2. At the corporate level the managerial capabilities required to deal with the responsibilities are predominantly perceptive, judgmental, and "gutfeel" and synthesis oriented in nature compared to the analytical and optimization orientation at the operating management level.
3. The executive management level has to have an even mix of both types. Furthermore, the task environment at the corporate level is externally oriented and uncertain, while at the operating level it is just the opposite.
4. At the executive management level, there is again a mixture of the two, but the external orientation is more specifically focused and certain compared to the corporate level, while the internal orientation is more aggregative, diluted, and uncertain compared to the lower levels of management.
5. The impact of the different structural and task environmental characteristics at different levels of management on the basic purpose and contents of MIS is very much pronounced.
6. The purpose of TMIS is to primarily sensitize and give the feel for a situation developing within or outside the organization to the corporate management.
7. The purpose of management information at the executive management level is to provide a basis for performance planning and control while at the operating level the major purpose is day-to-day control of operations.
8. The contents are consequently distributed from "soft," qualitative, unstructured, and verbal data on one end to "hard," statistical, accounting, and structured data on the other. From the system design viewpoint, it should be recognized that at each level of management there is a mix of attributes and the question is not of presence or absence but of their relative significance.
9. A framework for TMIS can thus be developed by synthesizing the structural considerations and the complementary systems requirements. A similar framework also emerges from the conclusions of analyses of managerial decision-making processes at the corporate level.
10. These processes seem to be more relational and holistic than ordered and sequential, and more intuitive than intellectual." In relation to the content and use of top managers' information, he has found that "a great deal of the managers' inputs are soft and speculative \_\_ Furthermore, the very analytical inputs—reports, documents, and hard data in general—seems to be of relatively little importance— They (the managers) synthesize rather analyse it. A great deal of this information helps the manager understand implicitly his organization and its environment, to see the big picture.
11. This implies relational holistic use of information." He identifies "strategy" as an "organization's conception of how to deal with its environment for a while" and since changes in the environment are not subjected to a regular pattern but occur in fits and starts, the burden to cope with such changes over and above the formalized strategic planning activity "falls on the manager, specifically on his mental processes intuitional and experiential—that can deal with the irregular inputs from the environment."

**Decision support system**

Meaning: The term DSS refers to a class of systems, which supports the process of making decisions. The Emphasis is on “support” rather than on automation of decision. DSS allow the decision maker to retrieve data and test alternative solutions during the process of problem solving.

Definition: According to Scott Morton, “DSS as interactive computer based systems, which help decision makers utilize data and model to solve unstructured problems”.

Examples of DSS:

Group DSS

Computer support Co-operative work

Logistics systems

Financial planning system

**Characteristics of decision support systems:**

Provide rapid access to information: some DSS provides fast the dashboard of a car or truck are used to see how the vehicle is running.

Handle large amount of data from different sources: advanced database management systems and data warehouses have allowed decision makers to search for information with a DSS even when some data resides in different databases on different computer systems or network.

Provide report and presentation flexibility: managers can get the information they want presented in a format that suits their needs. Produce text, tables, line drawings, pie charts, trend lines, and more.

Support drill down analysis: a manager can get more levels of detail when needed by drilling down through data.

Perform complex, sophisticated analysis and comparisons using advanced software packages: marketing research surveys.

**Classification of DSS:**

File drawer systems: these allow immediate access to data item. They are basically online mechanized versions of manual filing systems.

Data analysis systems: these allow the manipulation of data by means of either analysis operations tailored to the task or setting or general analysis operations. Analysis information systems: these provide access to a series of data base and small models.

Accounting models: these calculate the consequences of planned actions on the basis of accounting definitions. They typically generate estimates of income, balance sheets, etc., based on variation in input values to the definitional formulas.

Representational models: these estimate the consequences of action on the basis of models that represents some non-definitional characteristics of the systems such as probabilities of occurrence.

Optimization models: these provide guidelines for action by generating the optimal solution consistent with a series of constraints.

Suggestion models: these compute a specific suggested decision for a fairly structured and repetitive decision

**Steps in constructing a DSS**:

Choosing the project or problem to be solved.

Selecting hardware and software. Data acquisition and management.

Model subsystem acquisition and management.

Dialogue subsystem and its management.

Knowledge component.

Packaging. Testing, evaluation and improvement.

User training.

Documentation and maintenance.

Adaptation

**Advantages OF DSS**

Improving personal efficiency: many DSS do not do anything. A person could not do himself or herself. People prepared budgets for centuries before spreadsheet software came in to use. DSS help them do it faster and with less change of error.

Improving problem solving: a DSS can make it possible for a person or a group to solve problem faster or better, than they could without it.

Facilitating communications: after found that DSS facilitating interpersonal communication in several ways. In addition technology developments that have occurred since his or her research have opened up for DSS to provide this benefit.

Promoting learning or training: using a DSS can also help people learned more about using computers and about software package that are in the DSS although this is seldom a specific objective of developing the DSS it can be valuable by project.

Increasing organisational control: some DSS can also control information about an individual’s decision to his or her managers.

**Disadvantages OF DSS**

Limited storage capability: due to its small memories and limited storage capabilities, DSS has definite computational constraints. Slow: it is slow compared to the speed of large mainframes.

Limited information sharing: most DSSs are designed for individual use but they can be designed so that several computers can be linked for limited information sharing.

Difficult: it is difficult to know interdependencies of functions provided by system.

Require extensive knowledge: there are applications that require extensive knowledge of specific problem domain or technical knowledge.

Translation problems: users have to deal with several databases and model each with different data models and resulting translation problems.

Confliction: users may have to work on several decision scenarios at same time. As a consequence they have to keep track of what they done for each of them

Decision support systems (DSS) are interactive software-based systems intended to help managers in decision-making by accessing large volumes of information generated from various related information systems involved in organizational business processes, such as office automation system, transaction processing system, etc.

DSS uses the summary information, exceptions, patterns, and trends using the analytical models. A decision support system helps in decision-making but does not necessarily give a decision itself. The decision makers compile useful information from raw data, documents, personal knowledge, and/or business models to identify and solve problems and make decisions.

**Programmed and Non-programmed Decisions**

There are two types of decisions - programmed and non-programmed decisions.

Programmed decisions are basically automated processes, general routine work, where −

* These decisions have been taken several times.
* These decisions follow some guidelines or rules.

For example, selecting a reorder level for inventories, is a programmed decision.

Non-programmed decisions occur in unusual and non-addressed situations, so −

* It would be a new decision.
* There will not be any rules to follow.
* These decisions are made based on the available information.
* These decisions are based on the manger's discretion, instinct, perception and judgment.

For example, investing in a new technology is a non-programmed decision.

Decision support systems generally involve non-programmed decisions. Therefore, there will be no exact report, content, or format for these systems. Reports are generated on the fly.

**Attributes of a DSS**

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

**Characteristics of a DSS**

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

**Benefits of DSS**

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

**Components of a DSS**

Following are the components of the Decision Support System −

* **Database Management System (DBMS)** − To solve a problem the necessary data may come from internal or external database. In an organization, internal data are generated by a system such as TPS and MIS. External data come from a variety of sources such as newspapers, online data services, databases (financial, marketing, human resources).
* **Model Management System** − It stores and accesses models that managers use to make decisions. Such models are used for designing manufacturing facility, analyzing the financial health of an organization, forecasting demand of a product or service, etc.

**Support Tools** − Support tools like online help; pulls down menus, user interfaces, graphical analysis, error correction mechanism, facilitates the user interactions with the system.

**Classification of DSS**

There are several ways to classify DSS. Hoi Apple and Whinstone classifies DSS as follows −

* **Text Oriented DSS** − It contains textually represented information that could have a bearing on decision. It allows documents to be electronically created, revised and viewed as needed.
* **Database Oriented DSS** − Database plays a major role here; it contains organized and highly structured data.
* **Spreadsheet Oriented DSS** − It contains information in spread sheets that allows create, view, modify procedural knowledge and also instructs the system to execute self-contained instructions. The most popular tool is Excel and Lotus 1-2-3.
* **Solver Oriented DSS** − It is based on a solver, which is an algorithm or procedure written for performing certain calculations and particular program type.
* **Rules Oriented DSS** − It follows certain procedures adopted as rules.
* **Rules Oriented DSS** − Procedures are adopted in rules oriented DSS. Export system is the example.
* **Compound DSS** − It is built by using two or more of the five structures explained above.

**Types of DSS**

Following are some typical DSSs −

* **Status Inquiry System** − It helps in taking operational, management level, or middle level management decisions, for example daily schedules of jobs to machines or machines to operators.
* **Data Analysis System** − It needs comparative analysis and makes use of formula or an algorithm, for example cash flow analysis, inventory analysis etc.
* **Information Analysis System** − In this system data is analyzed and the information report is generated. For example, sales analysis, accounts receivable systems, market analysis etc.
* **Accounting System** − It keeps track of accounting and finance related information, for example, final account, accounts receivables, accounts payables, etc. that keep track of the major aspects of the business.
* **Model Based System** − Simulation models or optimization models used for decision-making are used infrequently and creates general guidelines for operation or management.

**GDSS**

GDSS is the abbreviation for Group Decision Support System. It is a [system that supports decision-making](https://www.toppers4u.com/2020/11/decision-support-systems-components.html) and has been designed and structured in such a way so that the members constituting a group can interact with each other to arrive at a particular decision. It provides support for various group decision-making activities such as file sharing, integration of the individual opinions with that of the group, communication, modelling of group actions and any other action which requires interaction of the group members.

**The main characteristic of the Group Decision Support Systems or GDSS** is to support exchange and flow of [information](https://www.toppers4u.com/2021/02/information-technology-it-industries.html) and ideas seamlessly between various members of the decision-making group. It also maintains the privacy of the members. There are also many other terms that have been introduced for the use of [information technology](https://www.toppers4u.com/2021/02/information-technology-it-industries.html) in decision-making within a group. Some of the popular terms that are in use include Group Support System (GSS), [Computer-Supported Co-operative Work (CSCW)](https://en.wikipedia.org/wiki/Computer-supported_cooperative_work), computerised collaborative work support and [Electronic Meeting System (EMS)](https://en.wikipedia.org/wiki/Electronic_meeting_system). Groupware is the term that has been coined for software used in such a scenario.

Thus, a computer-based system is interactive in  nature and helps in solving problems that are unstructured in nature when a group of decision makers are working in collaboration with each other.

### Advantages of GDSS :

**1) More Information in Less Time :**

It is possible to gather huge amount of information in a very short time period as GDSS facilitates the members of the team to work parallel.

**2) Greater Participation :**

The risks associated with conformity pressure and [groupthink](https://en.wikipedia.org/wiki/Groupthink) is greatly decreased when the members of the group work in a GDSS because the members are able to express their thoughts freely. This is due to the anonymity feature extended by GDSS.

**3) More Structure :**

In a GDSS environment the discussions are much more concentrated and focused. Irrelevant degradations are greatly reduced.

**4) Automated Documentation :**

Comments are preserved forever and the system provides the result without any delay. Excellent graphics makes viewing more attractive.

### Disadvantages of GDSS :

**1) Cost :**

A significant amount of cost may be associated with putting up the infrastructure consisting of the room, network connectivity and the [software](https://www.toppers4u.com/2020/12/types-of-software-system-application.html).

**2) Security :**

This risk arises when the facility for setting up GDSS has been rented. There are chances that information gets leaked to the peers by a low level employee.

**3) Technical Failure :**

The system must be properly implemented to reduce the risk associated with loss of connectivity and power loss. It is highly dependent on [LAN/WAN](https://www.toppers4u.com/2021/01/network-analysis-objectives-advantages.html) infrastructure and bandwidth.

**4) Keyboarding Skills :**

If the members get frustrated they might participate less.

**5) Training :**

There is variation in the learning curve of the user in various situations.

**6) Perception of Messages :**

[MIS](https://www.toppers4u.com/2020/11/management-information-system-meaning.html)-interpretations may occur in case the members communicate less verbally.

### Features of Group Decision Support System (GDSS) :

**1) Ease of Use :**

It consists of an interactive interface that makes working with GDSS simple and easy.

**2) Better Decision Making :**

It provides the conference room setting and various software tools that facilitate users at different locations to make decisions as a group resulting in better decisions.

**3) Emphasis on Semi-structured and Unstructured Decisions :**

It provides important information that assists middle and higher level management in making semi-structured and unstructured decisions.

**4) Specific and General Support :**

The facilitator controls the different phases of the group decision support system meeting (idea generation, discussion, voting and vote counting, etc.) what is displayed on the central screen and the type of ranking and voting that takes place, etc. In addition, the facilitator also provides general support to the group and helps them to use the system.

**5) Supports all Phases of the Decision Making :**

It can support all the four phases of decision making, viz [intelligence](https://www.toppers4u.com/2020/12/business-intelligence-applications.html), design, choice, and implementation.

**6) Supports Positive Group Behavior :**

In a group meeting, as participants can share their ideas more openly without the fear of being criticized, they display more positive group behavior towards the subject matter of the meeting.

Components of Group Decision Support System (GDSS) :

**1) Hardware :**

It includes electronic hardware like the computer, equipment used for networking, electronic display boards and audiovisual equipment. It also includes the conference facility, including the physical set up – the room, the tables, and the chairs – laid out in such a  manner that they can support group discussion and teamwork.

**2) Software Tools :**

It includes various tools and techniques, such as electronic questionnaires, electronic brainstorming tools, idea organizers, tools for setting priority, policy formation tool, etc. The use of these software tools in a group meeting helps the group decision-makers to plan, organize ideas, gather information, establish priorities, take decisions and document the meeting proceedings. As a result, meetings become more productive.

**3) People :**

It compromises the members participating in the meeting, a trained facilitator who helps with the proceedings of the meeting, and an expert staff to support the hardware and software. The GDSS components together provide a favorable environment for carrying out group meetings.

**What is ESS?**

Also known as Executive Information System (EIS

Allows you to turn your organization's data into useful summarize reports

These reports are generally used by executive level managers for quick access to reports coming from all company levels and departments

The exact reporting tools and outcome of an Executive Support System completely depends on the ESS developer and it's intended industry use.

For example, Cambridge Systematics has ESS to support the investment planning process for the Ministry of Transportation.

**Characteristics of ESS -** **Executive Support System or Executive Information System**

⎫ Computer based information system

⎫ Enables users to extract summary data and solve complex problem

⎫ Provides rapid and direct access to timely information and management reports

⎫ Capable of both accessing both internal and external data

⎫ Provides extensive online analysis like trend analysis, scenario analysis, etc.

⎫ Can easily be given DSS support for decision making

**Components of ESS**

⎫ Hardware - Hardware The basic hardware needed for a typical EIS includes four components: ⎫ Input data-entry devices. These devices allow the executive to enter, verify, and update data immediately ⎫ The central processing unit (CPU), which is the kernel because it controls the other computer system components ⎫ Data storage files. The executive can use this part to save useful business information, and this part also help the executive to search historical business information easily ⎫ Output devices, which provide a visual or permanent record for the executive to save or read. This device refers to the visual output device such as monitor or printer

⎫ Software - Software A typical EIS includes four software components: ⎫ Text-handling software ⎫ Database ⎫ Graphic base ⎫ Model base

⎫ User interface - User interface ⎫ An EIS must be efficient to retrieve relevant data for decision makers, so the user interface is very important. ⎫ Several types of interfaces can be available to the EIS structure, such as scheduled reports, questions/answers, menu driven, command language, natural language, and input/output.

⎫ Telecommunications - Telecommunication ⎫ Transmitting data from one place to another has become crucial for establishing a reliable network. ⎫ In addition, telecommunications within an EIS can accelerate the need for access to distributed data.

**Advantages of ESS**

* Easy for upper level executive to use.
* Ability to analyze trends.
* Augmentation of managers' leadership capabilities.
* Enhance personal thinking and decision-making.
* Contribution to strategic control flexibility.
* Enhance organizational competitiveness in the market place.
* Instruments of change.