UNIT II

INFORMATION SYSTEMS Computers in Management – MIS Office Automation – Decision Support Systems – Expert Systems – Knowledge Work System – Artificial Intelligence – Group Decision Support System (GDSS).

Computers in management-MIS

Characteristics of Computerized MIS:

1. Ability to process data into information with accuracy and high speed. It involves complex computation, analysis, comparisons and summarization.
2. Organizing and updating of huge amount of raw data of related and unrelated nature, derived from internal and external sources at different periods of time.
3. The information processing and computer technology have been so advanced that managers are able to obtain real time information about ongoing activities and events without any waiting period.
4. The input data in computer can be converted into different output formats for a variety of purpose. The system is so organized that managers at different levels and in different activity units are in a position to obtain information in whatever form they want, provided that relevant — programmes or instructions have been designed for the purpose.
5. Super-human memory, tremendous volume of data and information and the set of instructions can be stored in the computer and can be retrieved as and when needed. Management can get bit of stored information from the computer in seconds.

Advantages of Computer: The usage of computer gives following advantages in comparison to manual MIS:

a) **Speed:** The speed of carrying out the given instructions logically and numerically is incomparable between computers and human beings. A computer can perform and give instructions in less than a millionth of second

b) **Accuracy:** Computer can calculate very accurately without any errors.

c) **Reliability:** The information stored in the computer is in digital format. The information can be stored for a long time and have long life. A user may feel comfortable and be rely on, while using information stored in computer.

d) **Storage:** Computer can store huge data for a long time in comparison to human brain.

e) **Automaticity:** Computers perform work automatically through user friendly and menu driven program.

f) **Repetitiveness:** Computer can be used repetitively to process information without any mental fatigue as in case of human brain.

g) **Diligence:** A computer is an electronic device. It does not suffer from the human traits of lack of concentration.

h) **No Feeling:** Computers are devoid of any emotions. They have no feelings and no instincts because they are machines.

Limitations of Computer:

a) **Lack of Common Sense:** Computer is only an electronic device. It cannot think. If we provide an incorrect data, it does not have a commonsense to question the correctness of the data.

b) **Memory Without Brain:** Computer can store data in its memory; however, if a wrong instruction is given to computer it does not have a brain to correct the wrong instruction.

OFFICE AUTOMATION SYSTEM (OAS)

Concept of office Automation System

Office automation is a widely used term today. It generally means the application of computer and communication technology to improve the productivity of ‚knowledge works'.

Office automation refers to the use of sophisticated electronic equipment and communication systems to carry out the ‚electronic tasks' the tasks include:

1. Text processing,
2. Data processing
3. Information storage,
4. Information retrieval and updating,
5. Message distribution,
6. Document transmission and reproduction,
7. Teleconferencing

Office automation is a process that involves people, procedure and technology. Office automation technology include word processor, telecommunication, reprographics, e-mail, e-filing, facsimile transmission, micro-graphics and voice technologies.

Office automation involves the use of computers, in conjunction with other electronic-equipment to automate the basic secretarial and clerical the basic secretarial and clerical tasks of office.

Basic office automation consists of word processors connected to one another to means of a local area network.

Office automation should be designed as a multi-function information system to provide executives decision support tools such as:

1. On-line access to databases,
2. Model building and forecasted building and forecasting,
3. Risk analysis,
4. Sophisticated graphics,
5. Integration of data and text,

6. Data communication

Some office automation systems go far beyond the function of providing word processing on networks. PCs or workstations are connected to a network.

Office automation support a large number of software packages that could be used as decision support tools. Important ones are:

Word processor, database management systems,

1. Electronic spreadsheets,
2. Graphics packages,
3. Electronic mail systems

Benefits of office automation include increased productivity, greater accuracy, lower clerical cost, continuously decreasing cost, decreasing size and increasing capabilities, quality and flexibility of outputs, and ease of operations.

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Figure 1 components of office Automation

Features of Office Automation System:
Here are some of the basic and most attractive features that fall under the category of office automation system. Keep reading to find out!
Reduces work load: Installing an office automation system will definitely reduce the work load. It will help you handle load easily and allow you to enjoy yourself at work.

Those who have installed office automation systems have only praised its benefits. It is known for lessening the work load burden and ensures you are able to work at office in peace.

Good at multitasking: There are several kinds of customs which are needed to perform in every firm. The thing with office automation system is that it can handle this custom of the firm in an easy manner. In fact, it makes multi-tasking much simpler and easy.

From being able to open the entrance gate to controlling temperatures inside offices, it will look after the processing steps along with the data and entries along with a good amount of work load which will be handled by the system itself.

Boosts feasibility: Feasibility always means being **able to make practical decisions**. Any work which feasibility doesn't have will remain in doubt. Office automation systems will always analyze the conformation of work in every office.

From time to time, you need to check the input as well as the output which makes work much more acceptable so that managers are able to evaluate. Getting good results or working on tasks can only happen when the results are feasible.

Apart from that, taking proper decisions could really help the managers handle a proper run among all competitors. Feasibility of work is something which is needed to proceed and must be ensured within the system.

Sustainability in office environment: Every system should be capable of making the workforce work on things that are given to them. That is how it will be able to confirm the sustainability and at the same time adapt themselves to the environment of the office.

In case the system is not all that popular and manageable, you might end up seeing a crushing failure of the office's lifestyle altogether. The failure of office automation systems will deteriorate the harmony as well as the order of these tasks and lead to drawbacks.

Proper advantages: Competitive advantages are always considered as the plus point in every firm. A firm may only begin to imagine handling and reigning over others only when it is able to increase the competitive advantages in other places.

The positivity of office automation systems will always **boost competitive advantage** over the other firms which is not even needed. It will keep adding to the prosperity of even more firms and get a much bigger assurance when it comes to surviving in a market that is so competitive.

Application Area

Accounting

- keep track of our income
- keep track of our expenses
- Overall performance of the business

Communication

- Electronic mailing
- Electronic Filing
- Voice communication

Appointments

- Schedule appointments and tasks with an ease.

- Keep notes and contact information on prospects, and clients that you can access in seconds.

Credits Cards

- To take credit card payments.
- Avoid having to wait for cheques to clear

Advantages of Office automation systems

- Increases efficiency
- Less time consuming
- Less paper needed
- Faster decision making
- Speed up in communication
- Accomplishes more in less time
- Greater precision
- Operation of highly repetitive task
- Ease of use
- Better security
- Money saving
- Less storage space is required for data, and copies can be easily transferred off-site for safe keeping in case of fire or other emergency
- Energy saving
- Space saving
- Increases safety
- Time saving
- Multiple people can be updated simultaneously in the event of schedule changes
- Office workers can process information faster, saving not only time but also supplies, space, and effort
- Reduce redundancy, Because the data are all in one place, the volume and related costs are reduced
- Data integrity, because the data are all in one place, updates are kept current.
- Shared data, the same data can be accessed, as applicable. The user can request a subset of the database and the database system will provide those data
- Data independence, a database system is an independent structure of data storage
- Fast response to user requests, A database system responds quickly because it allows users to cross organization files; the files are not separated by application.
- Centralized security, with all the data in one place, it is easier to control access. This applies particularly to sensitive or confidential material

DISADVANTAGES OF OFFICE AUTOMATION SYSTEMS

- Make employee lazy

- Eye strains
- Back pain
- Older staff members may have a harder time adjusting to new technology and be unable to use it efficiently
- Complexity. Setting up and maintaining a data base require extensive planning. The data base must be organized so that users can use it quickly and success fully.
- Once in service, it requires maintenance, updating, and monitoring Expense, The more complex the system, the more costly the hardware, personnel planning, developing and monitoring.
- Vulnerability, Central data cores concentrate information. if hardware or software problems destroy data, a firm needs clear recovery procedures and adequate personnel support

INTRODUCTION TO DECISION MAKING

Everybody makes decisions. It's a natural part of life, and most of the time we don't even think about the process. In an organization, decisions are made at every level. The level at which the decision is made can also determine the complexity of the decision in relation to the input of data and output of information.

Levels of Decision Making

In the previous units, we discussed the various types of Information Systems and how they relate to the levels of an organization. We can also relate those Information Systems to the types of decisions managers make.

1. **Strategic Decision Making**. These decisions are usually concerned with the major objectives of the organization, such as "Do we need to change the core business we are in?" They also concern policies of the organization, such as "Do we want to support affirmative action?"
2. **Management Control.** These decisions affect the use of resources, such as "Do we need to find a different supplier of packaging materials?" Management-level decisions also determine the performance of the operational units, such as "How much is the bottleneck in Production affecting the overall profit and loss of the organization, and what can we do about it?"
3. **Knowledge-Level Decision Making.** These decisions determine new ideas or improvements to current products or services. A decision made at this level could be "Do we need to find a new chocolate recipe that results in a radically different taste for our candy bar?"
4. **Operational control**. These decisions determine specific tasks that support decisions made at the strategic or managerial levels. An example is "How many candy bars do we produce today?"

TYPES OF DECISIONS: STRUCTURED VERSUS UNSTRUCTURED

Some decisions are very structured while others are very unstructured. You may wake up in the morning and make the structured, routine decision to get out of bed. Then you have to make the unstructured decision of what clothes to wear that day (for some of us this may be a very routine decision!).
Structured decisions involve definite procedures and are not necessarily very complex. The more unstructured a decision becomes, the more complex it becomes.

Information systems support different decisions at different organization levels. One size does not fit all when it comes to pairing the types of systems to the types of decisions. Every level of the organization makes different types of decisions, so the system used should fit the organizational level, as shown in the above figure. It's easy to develop an information system to support structured
decision making. Do you increase production on the day shift or hold it to the swing shift; do you purchase another piece of equipment or repair the old one? What hasn't been so easy to develop is a system that supports the unstructured decision making that takes place in the upper echelons of a company. Do we expand into foreign markets or stay within the confines of our own country; do we build a new plant in Arizona or Alabama; do we stop production of a long-time product due to falling demand or boost our marketing? The ability to create information systems to support the latter decisions is long overdue.

STAGES OF DECISION MAKING

Some people seem to make sudden or impulsive decisions. Other people seem to make very slow, deliberate decisions. But regardless of appearances, the decision-making process follows the same stages of development and implementation. Let's use the example of purchasing a new television, using the following figure.

The decision-making process

1. **Intelligence.** You identify the facts: You don't have a television or the one that you do have isn't any good. You intuitively understand what the problem is and the effect it's having on you. You missed your favorite show last night.
2. **Design.** You design possible solutions: You could watch the television in your neighbor's apartment or you could purchase a new one for yourself. Your neighbor will get annoyed if you keep coming over. On the other hand, you won't be able to go on vacation if you use your money to buy a new television.
3. **Choice.** You gather data that helps you make a better decision: Your neighbor doesn't like the same shows you like or she's getting rather tired of you being there. You also

determine that televisions cost a lot of money so you figure out how you can afford one. You choose to purchase a new television instead of watching your neighbor's.

4. **Implementation.** You implement the decision: You stop at the appliance store on your way home from work and carry out your decision to purchase a new television.
5. **Feedback.** You gather feedback: You're broke but you can watch anything you want!

of course, this is a simplified example of the decision-making process. But the same process is used for almost every decision made by almost every person. Information Systems help improve the decision-making process by

- providing more information about the problem
- presenting a greater variety of possible alternatives
- showing consequences and effects of choices
- measuring the outcome of different possible solutions
- providing feedback on the decision that is made

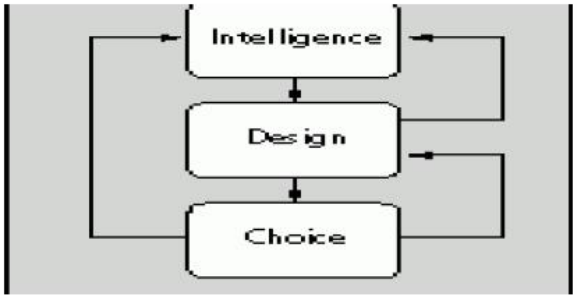
Different types of decisions require different types of systems. All decisions follow the same pattern although some may be more complex and require several iterations of the decision-making
stages.

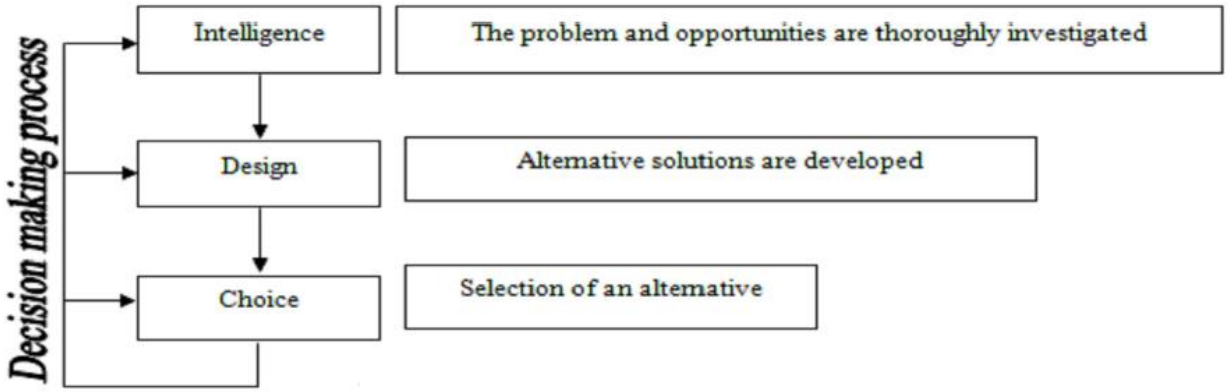
HEBERT A. SIMON 'DECISION SUPPORT SYSTEM MODEL

There are three phases in Hebert Simon model:

Intelligence: In this phase MIS collects the raw data. Further the data is sorted and merged with other data and computation are made, examined and presented. In this phase, the attention of the manager is drawn to the entire problem situation, calling for a decision.
Design: Manager develops a model of problem situation on which he can generate and test, summarizing the different decision alternatives and test the feasibility of implementation. Assess the value of the decision outcome.
Choice: In this phase the manager evolves a selection criterion and selects one alternative as decision based on selection criteria.
In these three phases if the manager fails to reach a decision, he starts the process all over again from intelligence phase where additional data and information is collected, the decision-making process is refined, the selection criteria is changed and a decision is arrived at.

Figure 2 ***Hebert A. Simon 'Decision Support System Model***





DECISION SUPPORT SYSTEMS

Decision support systems are a major category of management information systems. They are computer-based information systems that provide interactive information support to managers during the decision-making process. Decision support systems use:

- Analytical models
- Specialized databases
- Decision makers' own insights and judgements
- Interactive, computer-based modelling processes to support the making of semi structured and unstructured decisions by individual managers.

DSS are designed to be ad-hoc, quick-response systems that are initiated and controlled by managerial end users. Decision support systems are thus able to directly support the specific types of decisions and the personal decision-making styles and needs of individual managers.

Three major characteristics of DSS:

1. DSS are designed specifically to facilitate decision processes,
2. DSS should support rather than automate decision making, and
3. DSS should be able to respond quickly to the changing needs of decision makers.

Definition of DSS

1. Decision Support Systems (DSS) are a class of computerized information systems that support decision-making activities.
2. DSS are interactive computer-based systems and subsystems intended to help decision makers use communications technologies, data, documents, knowledge and/or models to successfully complete decision process tasks.
3. Aronson define DSS as "an interactive, flexible, and adaptable Computer Bases Information System specially developed for supporting the solution of a non-structured management problem for improved decision making

Scope of DSS

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

Characteristics of a DSS

1. **Facilitation.** DSS facilitate and support specific decision-making activities and/or decision processes.
2. **Interaction**. DSS are computer-based systems designed for interactive use by decision makers or staff users who control the sequence of interaction and the operations performed.
3. **Ancillary**. DSS can support decision makers at any level in an organization. They are NOT intended to replace decision makers.
4. **Repeated Use**. DSS are intended for repeated use. A specific DSS may be used routinely or used as needed for ad hoc decision support tasks.
5. **Task-oriented**. DSS provide specific capabilities that support one or more tasks related to decision-making, including: intelligence and data analysis; identification and design of alternatives; choice among alternatives; and decision implementation.
6. **Identifiable**. DSS may be independent systems that collect or replicate data from other information systems OR subsystems of a larger, more integrated information system.
7. **Decision Impact**. DSS are intended to improve the accuracy, timeliness, quality and overall effectiveness of a specific decision or a set of related decisions.

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

Functions of Decision Support Systems (DSS)

Using Decision Support Systems:

Using a decision support system involves an interactive ***analytical modelling*** process. Typically, a manager uses a DSS software package at his workstation to make inquires, responses and to issue commands. This differs from the demand responses of information reporting systems, since managers are not demanding prespecified information. Rather, they are exploring possible alternatives. They do not have to specify their information needs in advance. Instead they use the DSS to find the information they need to help them make a decision.

Using a DSS involves four basic types of analytical modelling activities:

- ***What-If Analysis:*** - In what-if-analysis, an end user makes changes to variables, or relationships among variables, and observes the resulting changes in the values of other variables.

- ***Sensitivity Analysis:*** - Is a special case of what-if analysis. Typically, the value of only one variable is changed repeatedly, and the resulting changes on other variables are observed. So, sensitivity analysis is really a case of what-if analysis involving repeated changes to only one variable at a time. Typically, sensitivity analysis is used when decision makers are uncertain about the assumptions made in estimating the value of certain key variables.

- ***Goal Seeking Analysis:*** **-** Reverses the direction of the analysis done in what-if and sensitivity analysis. Instead of observing how changes in a variable affect other variables, goal seeking analysis sets a target value for a variable and then repeatedly

changes other variables until the target value is achieved.

- ***Optimization Analysis:*** **-** Is a more complex extension of goal seeking analysis. Instead of setting a specific target value for a variable, the goal is to find the optimum value for one or more target variables, given certain constraints. Then one or more other variables are changed repeatedly, subject to the specified constraints, until the best values for the target variables are discovered.

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.

COMPONETS (OR) ARCHITECTURE OF DSS

There are three components of a typical DSS though a DSS cannot altogether be isolated from other information systems of an organization because all of them use a common database. DSS has three major components: -database, model base, and DSS software.

Database: - Database is a pre-requisite for developing any type of information system. Database is a collection of current and historical data from a number of groups or application and these data are organized for easy access by a range of applications. A DSS doesn't creates or update data as this is not its function; rather it uses live organizational data so that individuals and groups are able to make decisions based on actual conditions. While controlling and processing data from the database the DSS protects the integrity of data. Some large organizations do not provide direct access to a central database to DSS because of two reasons. First organization wants to protect data from accidental or inappropriate changes in database. Second it is a slow and expensive process for the DSS to search through large database. The process affects not only the performance of the DSS but also all the other systems using the database. Therefore, such organizations create separate DSS database extracting relevant data from both internal and external sources.

Model Base: - A model base is a collection of mathematical and analytical models that can be made accessible to the DSS users. A model is an abstract representation that illustrates the various components or relationships of a phenomenon. Model may be of different types: -

physical model (model of machine), mathematical model (equation, formula), and verbal model (description of a procedure for doing a work. Each DSS is built for a specific set of purposes. Most common models available in a model base are optimization models, Forecasting models and sensitivity analysis models.

i) Optimization models provide guidelines for action by generating optimal solution consistent with a series of constraints. An optimal solution is one that optimizes returns to the organization as whole either in the form of maximization of revenues or minimization of cost or both.

ii) Forecasting models are used to forecast an organization ‘s business prospects particularly in terms of sales. Forecasting model use historical data and extrapolate the likely behavior of these data in future. Organizations often use forecasting software to predict the likely actions of competitors.

iii) Sensitivity analysis models study the impact of discrete changes in parameters of optimal solution. a discrete change is one that happens on irregular basis. sensitivity analysis, working forward from known or assumed conditions, allows the users to vary certain values to test results in order to better predicts outcomes if changes occur in those values.

DSS Software: - The third component of a DSS is DSS software system ‘s software system permits easy interaction between the users and database and model base. DSS software system manages the creation, storage and retrieval of models from the model base and integrates them with data in the database. DSS software system also provides graphic, easy to use flexible user interface that supports interaction between the user and DSS. Since DSS are meant for higher level managers who are not experts in computer handling, the. User-DSS interface must be easy so that relevant information is extracted without much pain. Since each manager may have his own unique working style, the DSS software system must offer this flexibility. Desktop spreadsheet software, such as Lotus 1-2-3 or MS Excel provides such facilities.

Figure 3 COMPONETS OF DECISION SUPPORT SYSTEM

TYPES OF DSS

Data-Driven DSS

Data-Driven DSS take the massive amounts of data available through the company's TPS and MIS systems and cull from it useful information which executives can use to make more informed decisions. They don't have to have a theory or model but can "free-flow" the data.

The first generic type of Decision Support System is a Data- Driven DSS. These systems include file drawer and management reporting systems, data warehousing and analysis systems, Executive Information Systems (EIS) and Spatial Decision Support Systems. Business Intelligence Systems are also examples of Data-Driven DSS. Data- Driven DSS emphasize access to and manipulation of large databases of structured data and especially a time-series of internal company data and sometimes external data. Simple file systems accessed by query and retrieval tools provide the most elementary level of functionality. Data warehouse systems that allow the manipulation of data by computerized tools tailored to a specific task and setting or by more general tools and operators provide additional functionality. Data-Driven DSS with Online Analytical Processing (OLAP) provide the highest level of functionality and decision support that is linked to analysis of large collections of historical data.

Model-Driven DSS

A second category, **Model-Driven DSS,** includes systems that use accounting and financial models, representational models, and optimization models. Model-Driven DSS emphasize access to and manipulation of a model. Simple statistical and analytical tools provide the most elementary level of functionality. Some OLAP systems that allow complex analysis of data may be classified as hybrid DSS systems providing modeling, data retrieval and data summarization functionality. Model-Driven DSS use data and parameters provided by decision-makers to aid

them in analyzing a situation, but they are not usually data intensive. Very large databases are usually not needed for Model- Driven DSS.

Model-Driven DSS were isolated from the main Information Systems of the organization and were primarily used for the typical "what-if" analysis. That is, "What if we increase production of our products and decrease the shipment time?" These systems rely heavily on models to help executives understand the impact of their decisions on the organization, its suppliers, and its customers.

Knowledge-Driven DSS

The terminology for this third generic type of DSS is still evolving. Currently, the best term seems to be **Knowledge- Driven DSS.** Adding the modifier "driven" to the word knowledge maintains a parallelism in the framework and focuses on the dominant knowledge base component. Knowledge- Driven DSS can suggest or recommend actions to managers. These DSS are person computer systems with specialized problem-solving expertise. The "expertise" consists of knowledge about a particular domain, understanding of problems within that domain, and "skill" at solving some of these problems. A related concept is Data Mining. It refers to a class of analytical applications that search for hidden patterns in a database. Data mining is the process of sifting through large amounts of data to produce data content relationships.

Document-Driven DSS

A new type of DSS, a **Document-Driven DSS** or Knowledge Management System, is evolving to help managers retrieve and manage unstructured documents and Web pages. A Document-Driven DSS integrates a variety of storage and processing technologies to provide complete document retrieval and analysis. The Web provides access to large document databases including databases of hypertext documents, images, sounds and video. Examples of documents that would be accessed by a Document-Based DSS are policies and procedures, product specifications, catalogs, and corporate historical documents, including minutes of meetings, corporate records, and important

correspondence. A search engine is a powerful decision aiding tool associated with a Document-Driven DSS.

Communications-Driven and Group DSS

Group Decision Support Systems (GDSS) came first**,** but now a broader category of **Communications-Driven DSS** or groupware can be identified. This fifth generic type of Decision Support System includes communication, collaboration and decision support technologies that do not fit within those DSS types identified. Therefore, we need to identify these systems as a specific category of DSS. A Group DSS is a hybrid Decision Support System that emphasizes both the use of communications and decision models. A Group Decision Support System is an interactive computer-based system intended to facilitate the solution of problems by decision-makers working together as a group. Groupware supports electronic

communication, scheduling, document sharing, and other group productivity and decision support enhancing activities We have a number of technologies and capabilities in this category in the framework – Group DSS, two-way interactive video, White Boards, Bulletin Boards, and Email.

DIFFERENTIATE BETWEEN MANAGEMENT INFORMATION SYSTEM AND THE DECISION SUPPORT SYSTEM

S.NO.	MIS	DSS
1.	The main focus is on the structured tasks and the routine decisions.	Focus is mainly on the semi / un-structured tasks, which demand the managerial judgment.
2.	Identifies the information requirement.	Develops certain tools for using in the decision process.
3.	Data storage is of great importance	The main emphasis is on the data – manipulation.
4.	Delivers system depending on the frozen requirements.	Current data can be used in the Decision Support System.
5.	Only the in – direct access to the data by the managers is provided.	Managers enjoy direct access to the data.
6.	Very much dependent on the computer expert.	Depends on the managerial judgment.
7.	Access to the data possibly requiring a 'wait' for the manager's turn.	Waiting is not at all required.
8.	MIS manager may not completely understand the nature of the decision.	Manager possesses the knowledge about the nature of the decision and the decision-making environment.
9.	Main stress is on the efficiency.	Main emphasis is laid on the effectiveness.

EXPERT SYSTEM- ARTIFICIAL INTELLIGENCE

Expert system is software, which is used by the business executives to solve complex organizational problems. These are the programs, which act both as intelligently and as an expert in some area of knowledge. Modern business managers perform their duties under dynamic environment. Due to the complexity in the way, the business is conducted.

There are number of variables which are involved in decision making. This has made the overall decision-making process very complex to analyze the alternatives manually. The role of

operation research has been increasingly important in solving managerial problems. Expert systems are the programs, which incorporate all these decision-making techniques.

Expert system employs human knowledge captured in a computer to solve problems that ordinarily require human expertise. These can be used by non-experts to improve their problem-solving abilities. Expert System becomes a knowledgeable assistant to human experts. They are used to propagate search knowledge resources for improved consistent results.

Such systems could function better than any single expert, in making judgements in a specific, usually narrow area of expertise, termed as 'Domain'. This possibility may have a significant impact both on advisory professionals (financial analysts, lawyers, tax advisors etc.) and on organisation and management.

Components of Expert System

Knowledge Acquisition Subsystem:

Knowledge represented in the knowledge base has to be acquired from the expert. This is the job of the knowledge engineer. As this is a skilled and time-consuming operation, it is often this which limits the designing and functioning of expert system in a commercial environment.

Knowledge Acquisition program is used by an individual, who has expertise in the problem to, creates, add to or change the knowledge base. Potential sources of knowledge include human expert, research reports, textbooks, databases and the user's own experience.

Experts make decisions based on qualitative & quantitative information. The system engineer has to translate the standard procedures into the form suitable for the expert system. Acquiring the knowledge from experts is a complex task that often is a bottleneck in expert system construction.

The state of the art today requires a knowledge engineer to interact with one or more human experts in building knowledge base. Typically, the knowledge engineer helps to expert structure of the problem area by interrupting & integrating human answer to questions, by drawing analogies, posing counter examples, and bringing to light conceptual difficulties.

Knowledge Base:

This is the most important element of an expert system since it holds the expert's problem-solving knowledge. It is where the knowledge elicited from the expert is stored. It contains rules, facts and descriptions of objects etc.

With newer expert system products, the knowledge base is always stored in data. The information in knowledge base is everything that is necessary for understanding & formulating the problem & then solving it.

The key to knowledge base is how the knowledge is represented. The knowledge acquired from the expert has to be represented formally. Such knowledge representation deals with the structuring of the information, manipulation of information, and knowledge acquisition. The power of a system tends to be r elated from all sides of the knowledge in the knowledge base.

Interference Engine:

The interference engine is that part of the program which regains & determines how to apply the knowledge in the knowledge base to the facts & premises presented at the user interface. It performs this task in order to deduce new facts which are subsequently used to draw further conclusions. The interference engine is the active component of an expert system. It is the Brain of the expert system.

Interference engine is also known as the control structure or the rule interpreter. This component is essentially a computer program that processes the knowledge base to achieve the goal stipulated by the user, who is communicating with the system via the user interface. It provides a methodology for reasoning about information in the knowledge base & for formulating conclusions.

User Interface:

Expert system contains a language processor for friendly problem oriented-communications between the manager-user & the computer. This communication is best carried out in a natural language and in some cases; it is supplemented by the graphics.

The human computer interface or user interface technology allows users to interact with the system. The user presents the problem and has the conclusions presented to him. A significant feature of some expert systems is that they can justify the conclusions reached as well as explain why certain options were used or discarded.

There are different ways in which the initiative can be shared between the system and the user. The most straight forward method is that in which the system determines the flow of the interactive session by prompting the user with questions and asking for data, to be inputted. In this instance, the user cannot volunteer information.

In systems, where the initiative is shared, the whole decision-making process is shared between user and system. In a diagnostic system, the users can select a hypothesis and at each stage comment as to whether to continue along the same route or change it. Obviously, this type of system is much more complex to design.

The ultimate interface would be one allowing the user to take all of the initiative; to be able to input any number of suggestions in a natural language form. This is highly complex and is under constant development.

Figure 4 Components of Expert System

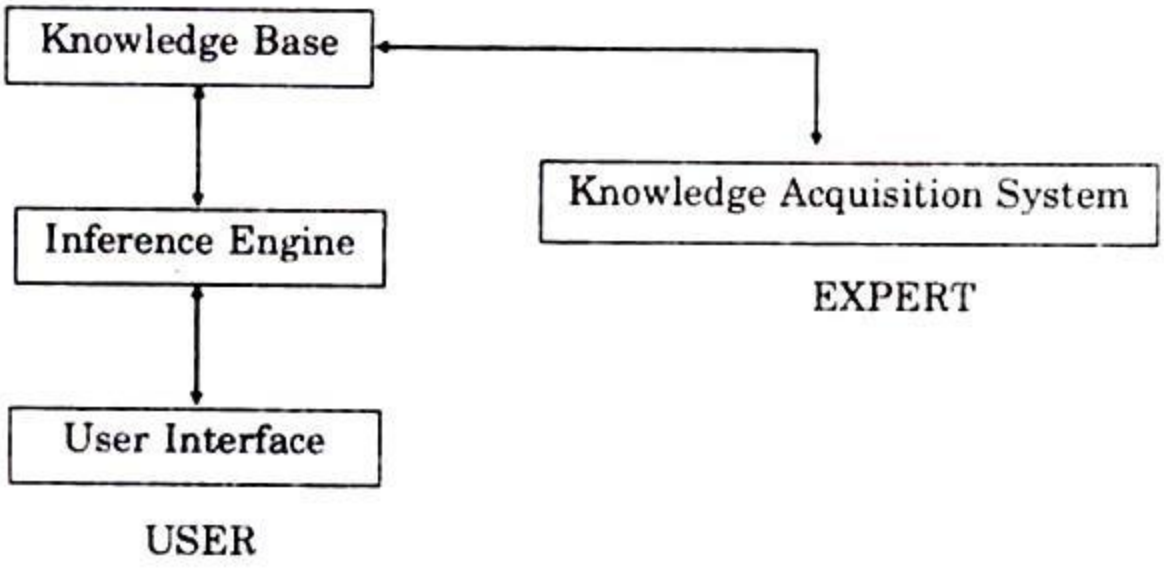


Fig. 19.1 Component/Structure of Expert System.

Advantages of Expert Systems

- It improves quality by providing consistent advice and by making reduction in the error rate.
- Expert systems are reliable and they do not overlook relevant information and potential solutions.
- It leads to cost reduction as the human expertise is costly.
- Expert system also has educational benefits as it gives training, provides experience & explanation facilities that can be used as a teaching device.
- It increases output as an expert system works faster than the human beings. As the expert system is computer-based system, it requires fewer people and hence reduces the cost.
- Expert system makes complex equipment's to work.
- It enhances problem solving as top expert's judgement is allowed into the analysis in enhancing the problem solving & increases the user's understanding through explanation.
- Expert system is compatible with many managers' decision styles because of their use of judgement.
- It is not subject to stress.
- An expert system can outperform a single human expert in many problem situations as it is faster & consistent.
- Expert system can be used to solve problems whose complexities exceed human ability that is scope of knowledge exceeds any one individuals' knowledge.
- Expert system helps to preserve and reproduce knowledge of experts.
- Expert system built a knowledge-based data base for the organisation.

Limitations of Expert System

- It is hard, even for a highly skilled expert to abstract good situational assessment when he is under time pressure.
- Expert system performs well with specific types of operational and analytical tasks.
- The designing and construction of expert system require expert engineers, they are rare and expensive. This limitation makes an expert system very costly.
- Expert system excels only in solving specified type of problems in a limited domain of knowledge.
- The vocabulary that experts use for expressing facts & relations is frequently limited.
- Another limitation is that most experts have no independent means of checking whether these conclusions are reasonable or not.
- The approach of each expert to the assessment of the situation may be different, yet it may be correct.
- Expert system is comparatively costly to develop and maintain.

Types of problems solved by expert systems

Expert systems are most valuable to organizations that have a high-level of know-how experience and expertise that cannot be easily transferred to other members. They are designed to carry the intelligence and information found in the intellect of experts and provide this knowledge to other members of the organization for problem-solving purposes. Typically, the problems to be solved are of the sort that would normally be tackled by a medical or other professional.

Real experts in the problem domain (which will typically be very narrow, for instance "diagnosing skin conditions in human teenagers") are asked to provide "rules of thumb" on how they evaluate the problems, either explicitly with the aid of experienced systems developers, or sometimes implicitly,

by getting such experts to evaluate test cases and using computer programs to examine the test data and (in a strictly limited manner) derive rules from that. Generally, expert systems are used for problems for which there is no single "correct" solution which can be encoded in a conventional algorithm — one would not write an expert system to find shortest paths through graphs, or sort data, as there are simply easier ways to do these tasks. Simple systems use simple true/false logic to evaluate data. more sophisticated systems are capable of performing at least some evaluation, taking into account real-world uncertainties, using such methods as fuzzy logic. Such sophistication is difficult to develop and still highly imperfect.

KNOWLEDGE WORK SYSTEM

Knowledge management systems refer to any kind of IT system that stores and retrieves knowledge, improves collaboration, locates knowledge sources, mines repositories for hidden knowledge, captures and uses knowledge, or in some other way enhances the KM process.

knowledge management systems are as follows:

- Inadequate support: managerial and technical, during both implementation and use.
- Expecting that the technology is a KM solution in itself.
- Failure to understand exactly what the firm needs (whether technologically or otherwise).
- Not understanding the specific function and limitation of each individual system.
- Lack of organizational acceptance, and assuming that if you build it, they will come – lack of appropriate organizational culture.
- Inadequate quality measures (e.g. lack of content management).
- Lack of organizational/departmental/etc fit - does it make working in the organization. easier? Is a system appropriate in one area of the firm but not another? Does it actually disrupt existing processes?
- Lack of understanding of knowledge dynamics and the inherent difficulty in transferring tacit knowledge with IT based systems (see segment on tacit knowledge under knowledge sharing).
- Lack of a separate budget.

The Knowledge Management Value Chain

The knowledge management refers to the set of business processes developed in an organization to create, store, transfer, and apply knowledge.

Figure 5 The Knowledge Management Value Chain

Knowledge Acquisition

Organizations acquire knowledge in a number of ways, depending on the type of knowledge they seek.

Knowledge Storage

Once they are discovered, documents, patterns, and expert rules must be stored so they can be retrieved and used by employees.

Knowledge Dissemination

Portals, e-mail, instant messaging, wikis, social networks, and search engines technology have added to an existing array of collaboration technologies and office systems for sharing calendars, documents, data, and graphics.

Knowledge Application

Regardless of what type of knowledge management system is involved, knowledge that is not shared and applied to the practical problems facing firms and managers does not add business value. To provide a return on investment, organizational knowledge must become a systematic part of management decision making and become situated in decision-support system.

Types of Knowledge Management Systems

There are essentially three major types of knowledge management systems: enterprise-wide knowledge management systems, knowledge work systems, and intelligent techniques.

Enterprise-wise knowledge management systems are general-purpose firmwide efforts to collect, store, distribute, and apply digital content and knowledge. **Knowledge work system (KWS)** are specialized systems built for engineers, scientists, and other knowledge workers charged with discovering and creating new knowledge for a company. Knowledge management also includes a diverse group of intelligent **techniques**, such as data mining, expert systems, neural networks, fuzzy logic, genetic algorithms, and intelligent agents.

Enterprise Content Management Systems

It helps organizations manage both types of information. They have capabilities for knowledge capture, storage, retrieval, distribution, and preservation to help firms improve their business processes and decisions. **Digital asset management** systems help companies classify, store, and distribute these digital objects.

Knowledge Network Systems

Knowledge network systems, also known as expertise location and management systems, address the problem that arises when the appropriate knowledge is not in the form of a digital document but instead resides in the memory of expert individuals in the firm.

Collaboration Tools and Learning Management Systems

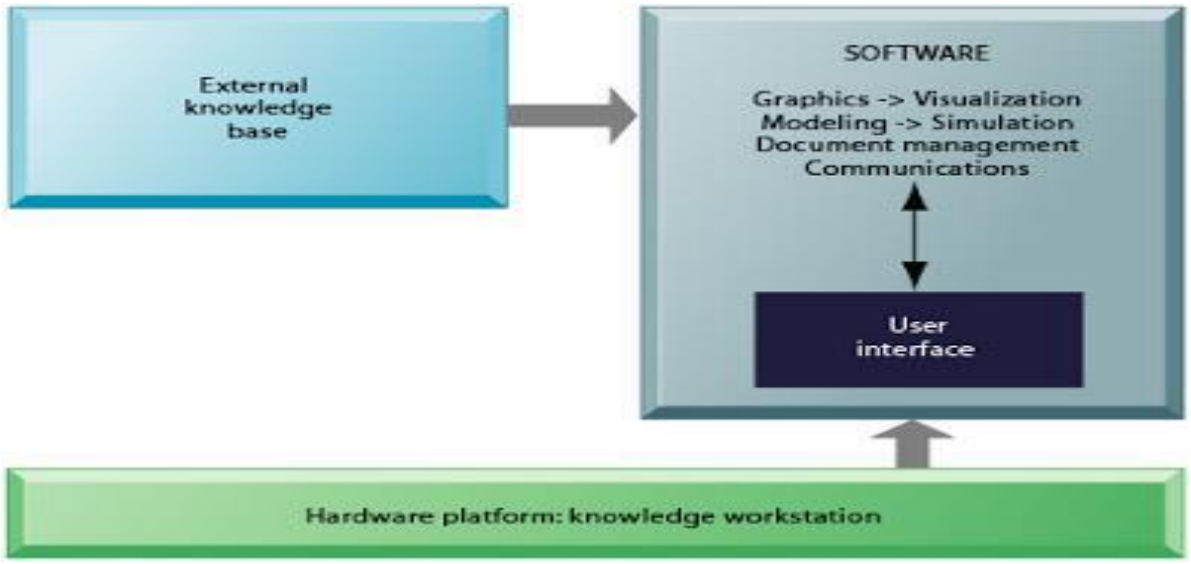
The major enterprise content management systems include powerful portal and collaboration technologies. Enterprise knowledge portals can provide access to external sources of information such as news feeds and research, as well as to internal knowledge resources along with capabilities for e-mail, chat/instant messaging, discussion groups, and videoconferencing. **Social bookmarking** makes it easier to search for and share information by allowing users to save their bookmarks to Web pages on a public Web site and tag these bookmarks with keywords.

Knowledge Workers and Knowledge Work

Knowledge workers, include researchers, designers, architects, scientists, and engineers who primarily create knowledge and information for the organization. They perform three key roles that are critical to the organization and to the managers who work within the organization:

- Keeping the organization current in knowledge as it develops in the external world - in technology, science, social thought, and the arts
- Serving as internal consultants regarding the areas of their knowledge, the changes taking place, and opportunities
- Acting as change agents, evaluating, initiating, and promoting change projects

Figure 6 Requirements of Knowledge Work Systems



Intelligent Techniques

Artificial intelligence and database technology provide a number of intelligent techniques that organizations can use to capture individual and collective knowledge and to extend their knowledge base. Neural networks and data mining are used for **knowledge discovery**. Artificial

intelligence (AI) technology, which consists of computer-based systems (both hardware and software) that attempt to emulate human behavior.

Capturing Knowledge: Expert Systems Expert systems are an intelligent technique for capturing tacit knowledge in a very specific and limited domain of human expertise.

Organizational Intelligence: Case-Based Reasoning

Expert systems primarily capture the tacit knowledge of individual experts, but organizations also have collective knowledge and expertise that they have built up over the years. In **case-based reasoning (CBR)**, descriptions of past experiences of human specialists, represented as cases, are stored in a database for later retrieval when the user encounters a new case with similar parameters.

Fuzzy Logic Systems

Fuzzy logic is a rule-based technology that can represent such impression by creating rules that use approximate or subjective values.

Neural Networks

Neural networks are used for solving complex, poorly understood problems for which large amounts of data have been collected. They find patterns and relationships in massive amounts of data that would be too complicated and difficult for a human being to analyze. Neural networks discover this knowledge by using hardware and software that parallel the processing patterns of the biological or human brain.

Genetic Algorithms

Genetic algorithms are useful for finding the optimal solution for a specific problem by examining a very large number of possible solutions for that problem. They are based on techniques inspired by evolutionary biology, such as inheritance, mutation, selection, and crossover (recombination).

Hybrid AI Systems

Genetic algorithms, fuzzy logic, neural networks, and expert systems can be integrated into a single application to take advantage of the best features of these technologies. Such systems are called **hybrid AI systems**.

Intelligent Agents

Intelligent agents are software programs that work in the background without direct human intervention to carry out specific, repetitive, and predictable tasks for an individual user, business process, or software application. **Agent-based modeling** applications have been developed to model the behavior of consumers, stock markets, and supply chains and to predict the spread of epidemics.

Advantages and Disadvantages

A good **knowledge management system** will make it easy to find and reuse relevant information and resources across your business. This, in turn, can help you to:

- create better products and services
- develop better strategies
- improve profitability
- reuse existing skills and expertise
- increase operational efficiency and staff productivity
- recognise market trends early and gain advantage over your rivals
- benchmark against your competitors
- make the most of your collective intellectual capital

Resourceful collaboration will bring more views, diverse opinions and varied experiences to the process of decision-making, helping your business to make decisions based on collective knowledge and expertise.

Disadvantages of knowledge management

The key to any successful knowledge management system is knowing its limitations. Some of the **common challenges** include:

- finding ways to efficiently capture and record business knowledge
- making information and resources easily to find
- motivating people to share, reuse and apply knowledge consistently
- aligning knowledge management with the overall goals and business strategy
- choosing and implementing knowledge management technology
- integrating knowledge management into existing processes and information systems

Group Decision Support System (GDSS).

A **Group Decision Support System**, or GDSS, consists of interactive software that allows for making decisions by a group of participants. The goal of a GDSS is to improve the productivity of a group to come to a decision. A GDSS is sometimes also referred to as a 'computerized collaborative work system.'

A Group Decision Support System (GDSS) is an interactive, computer-based system that helps a team of decision-makers solve problems and make choices. GDSS are targeted to supporting groups in analyzing problem situations and in performing group decision-making tasks. The name is very descriptive. A GDSS is a hybrid system that uses an elaborate communications infrastructure and heuristic and quantitative models to support decision-making.

A group decision support system (GDSS) is an interactive computer based system that facilitates a number of decision-makers (working together in a group) in finding solutions to problems that are unstructured in nature. They are designed in such a way that they take input from multiple users interacting simultaneously with the systems to arrive at a decision as a group.

The tools and techniques provided by group decision support system improve the quality and effectiveness of the group meetings. Groupware and web-based tools for electronic meetings and videoconferencing also support some of the group decision making process, but their main function is to make communication possible between the decision makers.

In a group decision support system (GDSS) electronic meeting, each participant is provided with a computer. The computers are connected to each other, to the facilitator's computer and to the file server. A projection screen is available at the front of the room. The facilitator and the participants can both project digital text and images onto this screen.

A group decision support system (GDSS) meeting comprises different phases, such as idea generation, discussion, voting, vote counting and so on. The facilitator manages and controls the execution of these phases. The use of various software tools in the meeting is also controlled by the facilitator.

Characteristics of a GDSS

A GDSS has a number of unique characteristics to support a group of participants in their decision-making process:

- Special design to support creative thinking, effective communications and decision-making techniques
- Easy to use so participants from different backgrounds can all participate effectively
- Flexible so it can incorporate the different perspectives and decision-making styles of the different participants
- Automated record keeping for future review and analysis
- Parallel communication to allow multiple participants to contribute simultaneously

Features of Group Decision Support System (GDSS)

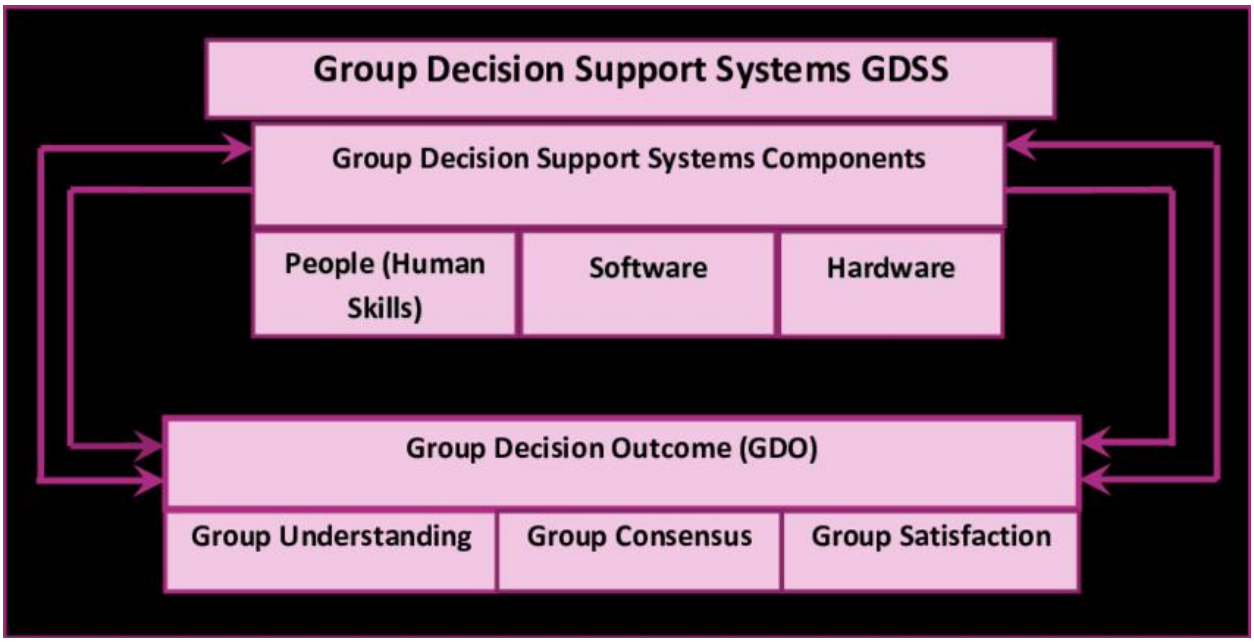
- **Ease of Use:** It consists of an interactive interface that makes working with GDSS simple and easy.

- **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.
- **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.
- **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.
- **Supports all Phases of the Decision Making:** It can support all the four phases of decision making, viz intelligence, design, choice and implementation.
- **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)

A Group decision support system (GDSS) is composed of 3 main components, namely hardware, software tools, and people.

Figure 7 ***Components of Group Decision Support System (GDSS)***



- **Hardware:** It includes electronic hardware like computer, equipment used for networking, electronic display boards and audio-visual equipment. It also includes the conference facility, including the physical setup – the room, the tables and the chairs – laid out in such a manner that they can support group discussion and teamwork.
- **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 to document the meeting proceedings. As a result, meetings become more productive.
- **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.

Group Decision Support System (GDSS) Software Tools

Group decision support system software tools helps the decision makers in organizing their ideas, gathering required information and setting and ranking priorities. Some of these tools are as follows:

- **Electronic Questionnaire:** The information generated using the questionnaires helps the organizers of the meeting to identify the issues that need immediate attention, thereby enabling the organizers to create a meeting plan in advance.
- **Electronic Brainstorming Tools:** It allows the participants to simultaneously contribute their ideas on the subject matter of the meeting. As identity of each participant remains secret, individuals participate in the meeting without the fear of criticism.
- **Idea Organizer:** It helps in bringing together, evaluating and categorizing the ideas that are produced during the brainstorming activity.
- **Tools for Setting Priority:** It includes a collection of techniques, such as simple voting, ranking in order and some weighted techniques that are used for voting and setting priorities in a group meeting.
- **Policy Formation Tool:** It provides necessary support for converting the wordings of policy statements into an agreement.