Learning Objectives

The Learning objectives of the module are to explore relationship between corporate culture and Strategies, to address the following questions:

1. Understand the fundamentals of decision making and problem solving.
2. To understand the organizational structure of DSS concept originated.

1. Introduction

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.

In simple words, decision support system means helping managers in decision making process in order to achieve organizational objectives most appropriately. 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.

A DSS is a computer – based information system that supports business or organizational decision-making activities. It is a collection of integrated software applications and hardware that form the backbone of an organization's decision making process and help to make decisions, which may be rapidly changing and not easily specified in advance.

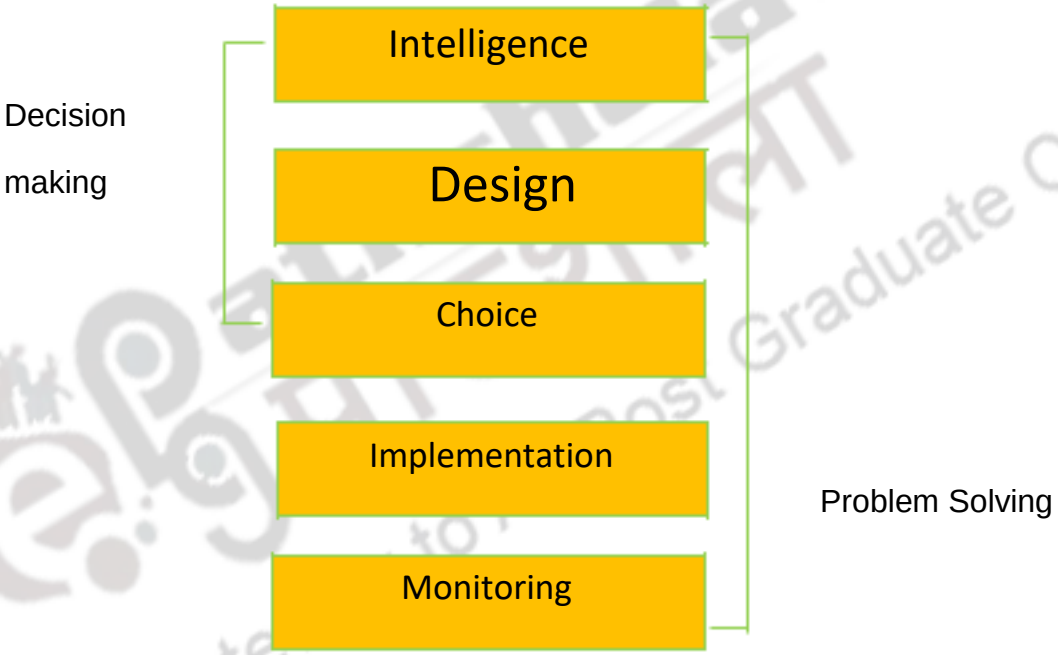


Figure1: Structure of Decision Support System

2. Types of Decisions

There are mainly two types of decisions:

Programmed Decision and Non-programmed decision

Programmed Decision:

Programmed decisions are repetitive and routine. It means a routine or repetitive decision that can be handled by established business rules or procedures. These types of decisions are often called for at certain points in a standard process, and are decided based on recognized and easily identifiable factors. To handle programmed decisions a definite procedure has been worked out. They are structured in nature.

Non-programmed Decision:

Non-programmed decisions are novel, unstructured, and unusually consequential. There is no cut-and dried method for handling the problem.

3. Taxonomies of DSS:

Various technologists differentiate DSS in different forms. Haettenschwiler differentiates DSS in three form namely, active decision support system, passive decision support system and cooperative decision support system, whereas, Daniel Power differentiates DSS in five forms namely, communication-driven decision support system, data-driven decision support system, document-driven decision support system, knowledge-driven decision support system and model-driven decision support system.

3.1 Haettenschwiler Taxonomies:

Active Decision Support System: Active decision support system is a system which brings explicit solutions to the problems arises in decision making process.

Passive Decision Support System: A passive decision support system is a system that aids in the process of decision making, but that cannot bring out explicit decision solutions or suggestions.

Cooperative Decision Support System: A cooperative decision support system allows for an iterative process between human and system towards the achievement of a consolidated solution. The decision maker can modify or refine the decision or suggestions provided by the system, before sending them back to the system for validation, and likewise the system again improves and refines the suggestions of the decision maker and sends them back to them for validation.

3.2 Daniel Power Taxonomies:

Communication Driven Decision Support System: In the communication driven decision support system decision of a problem is taken by more than one person. It involves cooperation and support of individuals. In this system different peoples are working on a shared task.

Data Driven Decision Support System: The data driven decision support system use internal data to solve the problems arises in decision making process. Sometimes, it also uses external data.

Document Driven Decision Support System: It manages, retrieves, and manipulates unstructured information in a variety of electronic formats.

Knowledge Driven Decision Support System: A knowledge driven decision support system provides specialized problem-solving expertise stored as facts, rules, procedures, or in similar structures.

Model Driven Decision Support System: It uses various models to find out optimum solution to the problems arises in decision making process. The model used in the model driven decision support system may be statistical model, financial model or simulation model. Model-driven DSS use data and parameters provided by users to assist decision makers in analyzing a situation.

3.3 Some Other Taxonomies:

Following are some typical DSSs:

Status Inquiry System: It helps in taking operational, management level or middle level management decisions. For examples, 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.

4. Attributes of a Decision Support System:

Following are some attributes of a decision support system.

a. Adaptability and flexibility
b. High level of Interactivity
c. Ease of use
d. Efficiency and effectiveness
e. Complete control by decision-makers
f. Ease of development
g. Extendibility
h. Support for modelling and analysis
i. Support for data access
j. Standalone, integrated, and web-based

5. Characteristics of Decision Support System: Following are the characteristics of decision support system.

a. It helps decision makers in semi-structured and unstructured problems.
b. It helps managers in decision making process at various managerial levels, ranging from executive to line managers.
c. Decision support system helps not only individuals but also a group of peoples because it is able to find out solutions to less structured problems. Less structured problems often required involvement of several individuals from different departments and organization level.
d. It also helps managers in interdependent or sequential decisions.
e. It supports variety of decision processes and styles.
f. Decision support systems are adaptive over time.

6. Benefits of Decision Support System: Following are the benefits of decision support system:

a. Decision support system improves efficiency and speed of decision making activities.
b. It increases the control, competitiveness and capability of futuristic decision-making of the organization.

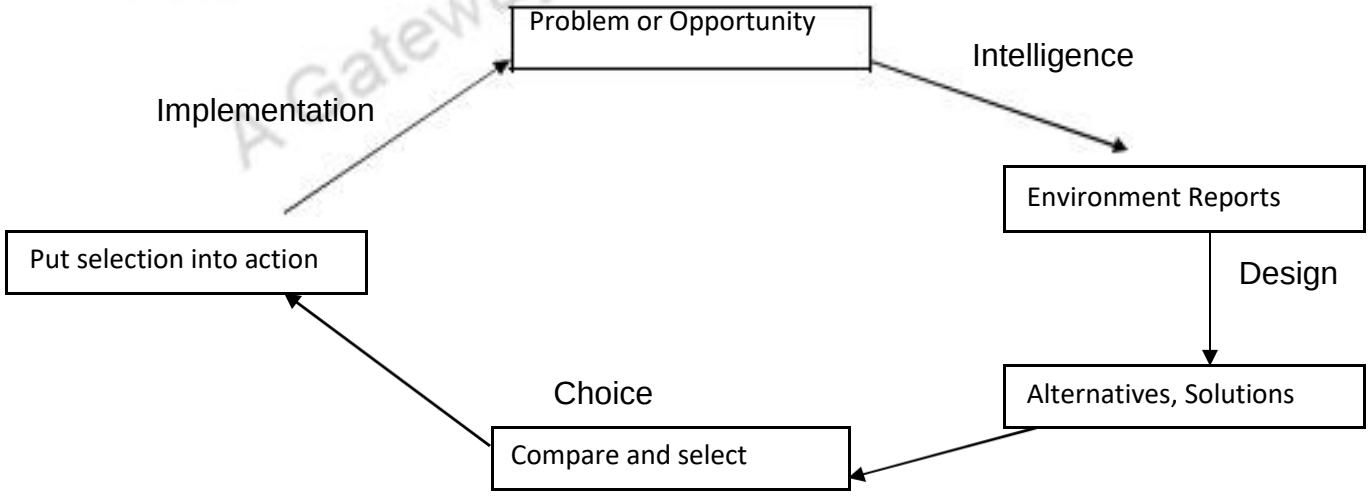
c. It is helpful to reduce communication gap between individuals and various departments.
d. It encourages people for learning or training.
e. It reveals new approaches to solve various problems arise in decision making process.
f. It improve the quality of decisions made-more alternatives can be evaluated, (can be performed) quick risk analysis using simulations, artificial intelligence methods.
g. As it utilise wireless technology, we can access information anytime and from anyplace and communicate the result of the analysis and interpretation.

7. The Steps of Decision Support System:

According to Simon the decision making process is a four phase process.

a. Intelligence: It means searching for conditions that calls for decisions.
b. Design: It means inventing, developing and analyzing solutions.
c. Choice: It means selecting a course of action.
d. Implementation: It means adapting the selected course of action.

Following figure shows the decision making process:

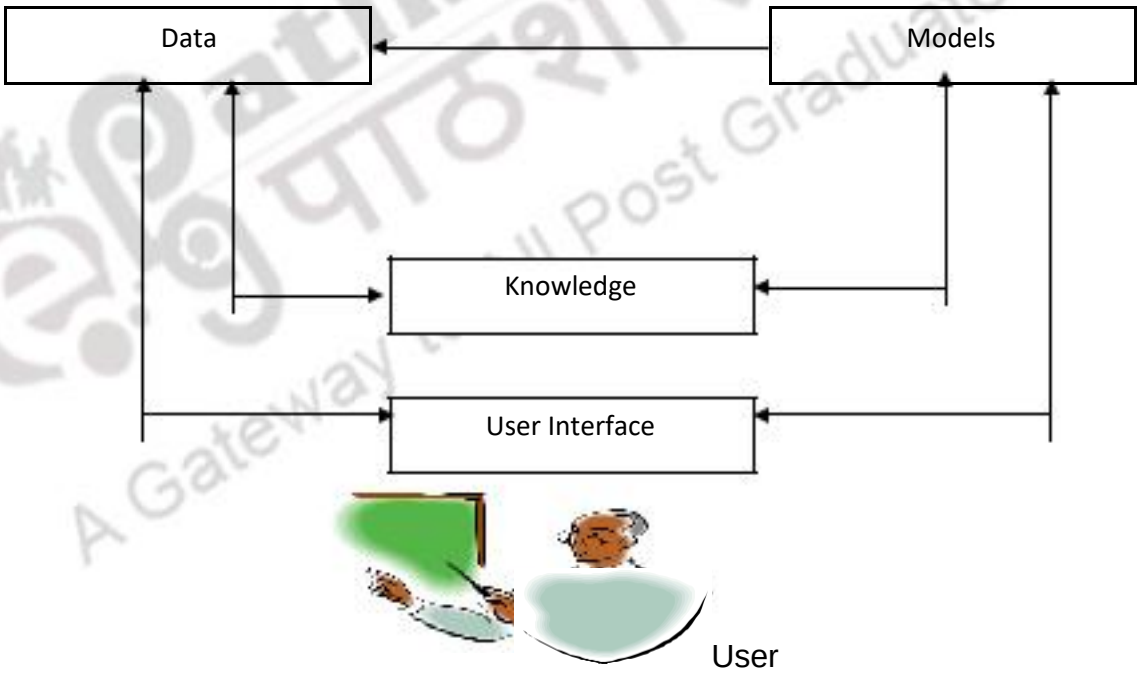


8. Components of Decision Support System:

A decision support system has five components namely data, models, Knowledge or intelligence, user and user interface. A brief description of these components is as under:

a. Data: As we know decision support system provides solutions to the problems. Every problem requires data from many sources.
b. Models: Models are used to manipulate data. Models may be standard or customized.
c. Knowledge or Intelligence: Systems sometimes have a knowledge or intelligence component.
d. User: Users are another important component.
e. User Interface: It is the last component of decision support system.

8.1 **Architecture of Decision Support System:**



9. Computerized Tools for Decision Support System:

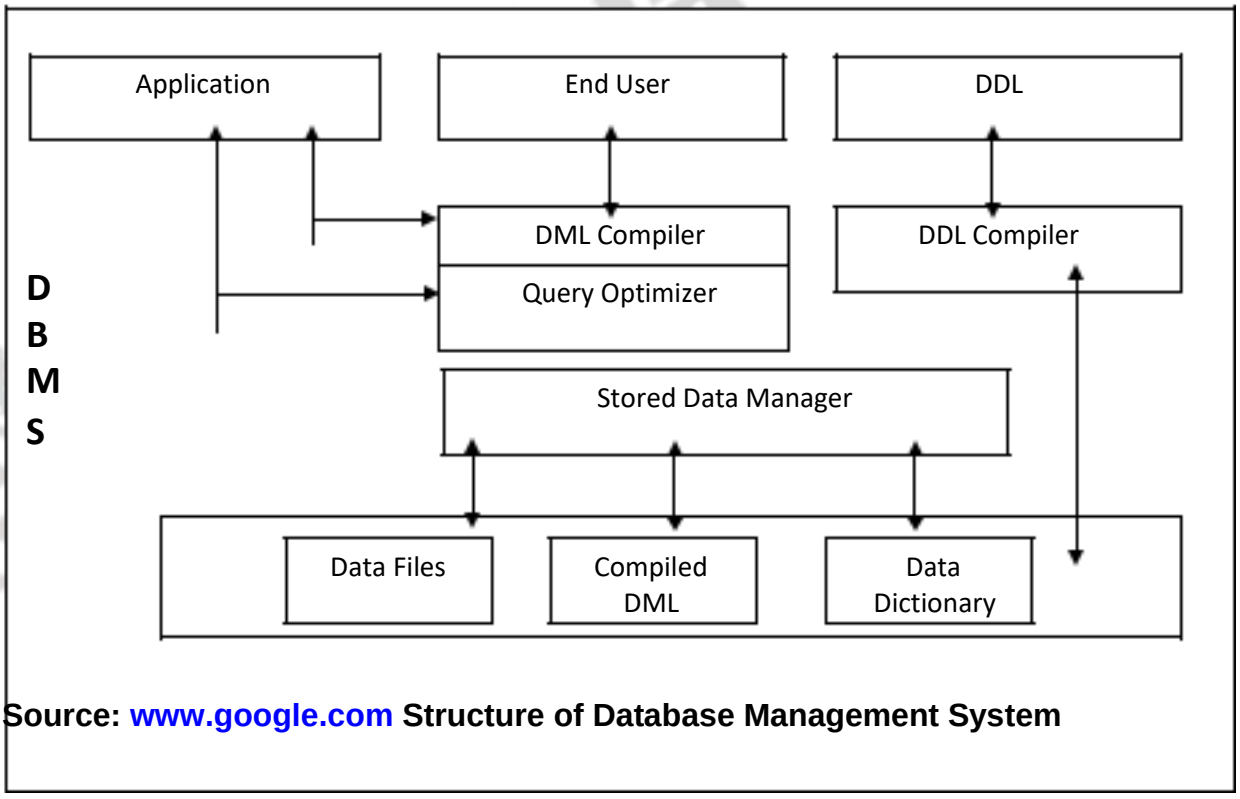
Following are some computerized tools for decision support system:

9.1 Data Management:

It includes database management system (DBMS), extraction, transformation and load system (ETL) and data warehouses (DW).

9.1.1. Database Management System:

A database is an organized collection of data. A database management system (DBMS) is a computer software application that interacts with the user, other applications, and the database itself to capture and analyze data. DBMS include MySQL, PostgreSQL, MongoDB, Microsoft SQL Server, Oracle, Sybase, SAP HANA and IBM DB2.



Source: www.google.com Structure of Database Management System

Different types of DBMS:

A. Relational Database Management System

B. Object Oriented Database Management System

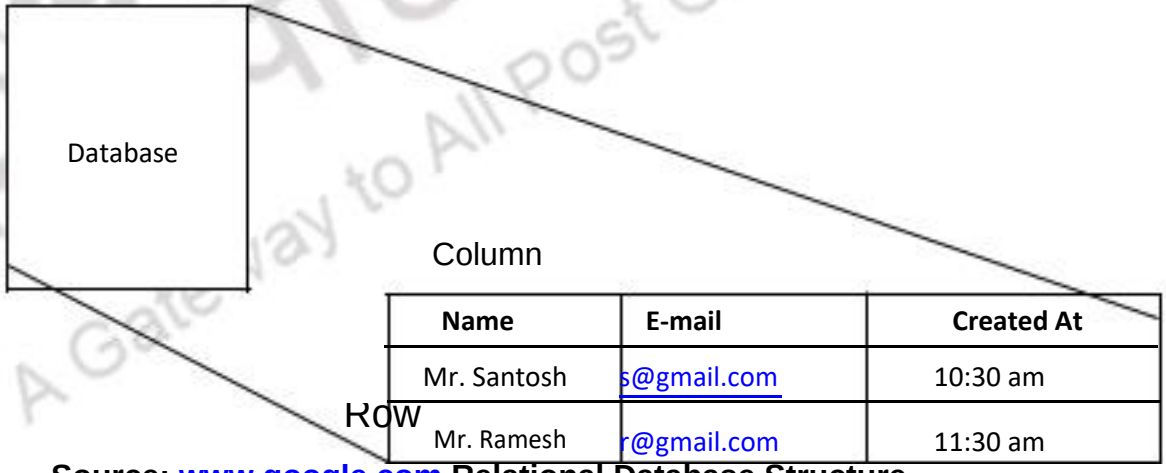
Relational Database Management System:

A relational database management system (RDBMS) is a database engine/system based on the relational model specified by Edgar F. Codd – the father of modern

relational database design in 1970. Most modern commercial and open source database applications are relational in nature.

In 1970, Edgar F. Codd, a British computer scientist with IBM, published “A Relational Model of Data for Large Shared Data Banks.” At the time, the renowned paper attracted little interest, and few understood how Codd’s groundbreaking work would define the basic rules for relational data storage, which can be simplified as:

1. Data must be stored and presented as relations, i.e., tables that have relationships with each other, e.g. primary/foreign keys.
2. To manipulate the data stored in tables, a system should provide relational operators-code that enables the relationship to be tested between two entities. A good example is the WHERE clause of a SELECT statement, i.e., the SQL statement SELECT* FROM CUSTOMER_MASTER WHERE CUSTOMER_SURNAME=’Smith’ will query the CUSTOMER_MASTER table and return all customers with a surname of Smith.



Source: www.google.com Relational Database Structure

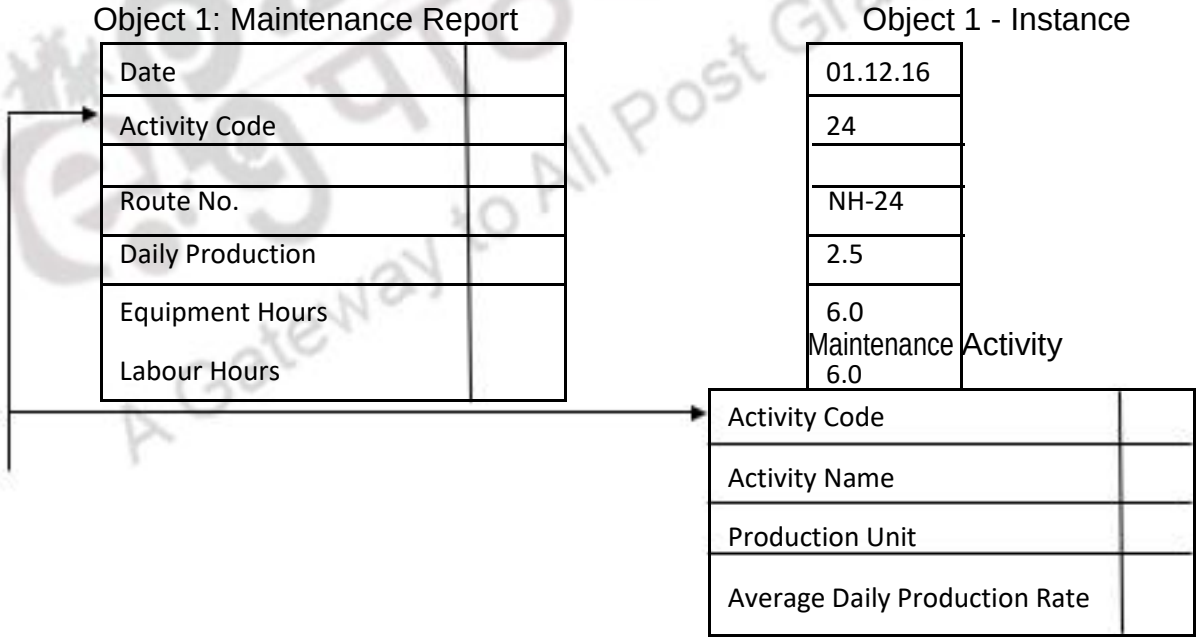
Object Oriented Database Management System:

The main limitation of relational database management system is that it can’t handle large and complex database. Object oriented database management system evolve to

short out the limitation of the relational database management system. This system is able to handle large and complex data that relational databases could not.

Object oriented databases are also called Object Database Management Systems (ODBMS). Object databases store objects rather than data such as integers, strings or real numbers. Objects are mainly used in C++, Java etc. Objects basically consist of the following:

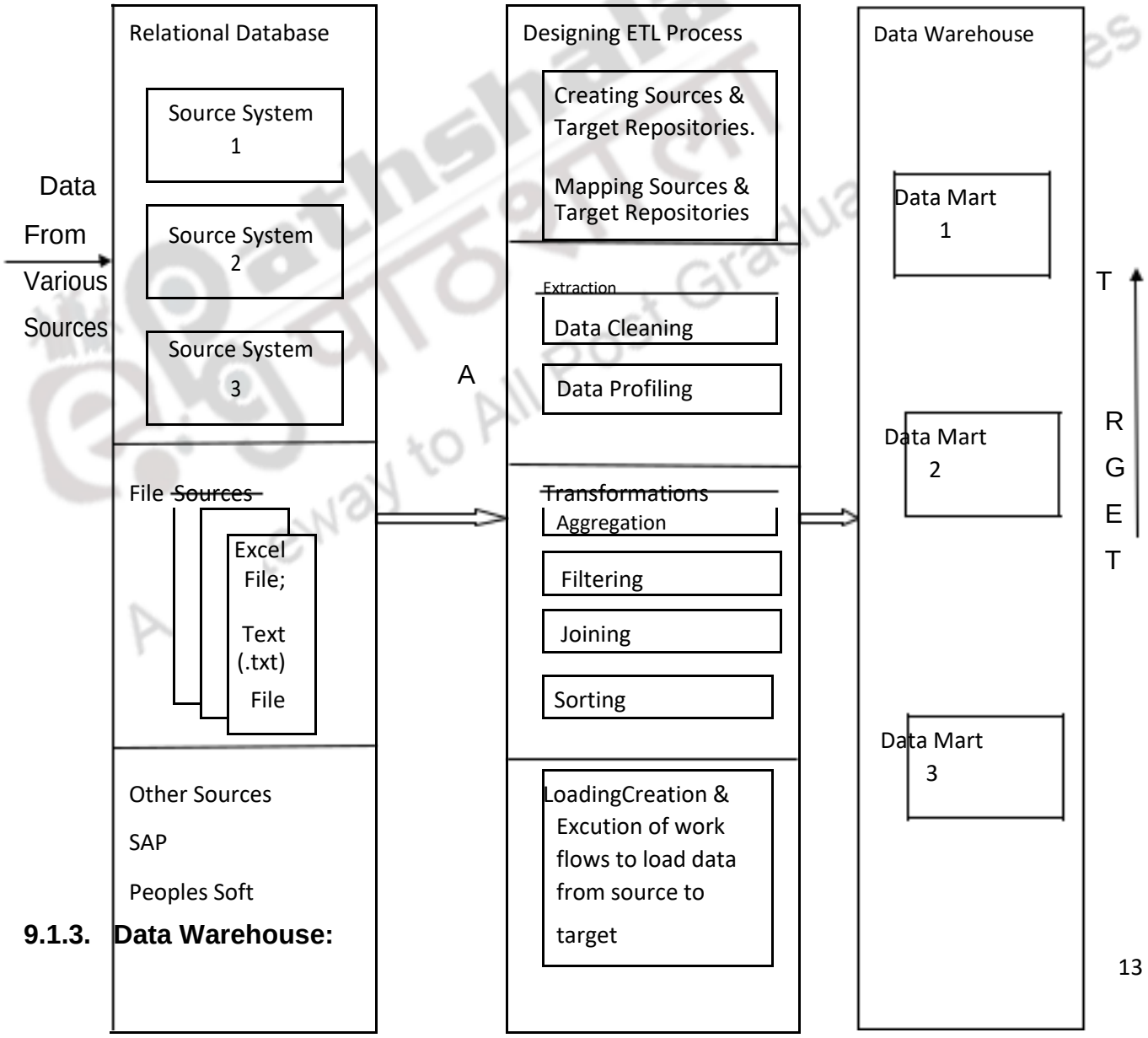
a. **Attributes:** The data which defines the characteristics of an object is known as attributes. This data may be simple such as integers, strings, and real numbers or it may be a reference to a complex object.
b. **Methods:** Methods define the behaviour of an object and are what was formally called procedures or functions.



Source: www.google.com Structure of Object Oriented Database Management System

9.1.2. Extraction, Transformation and Load System (ETL):

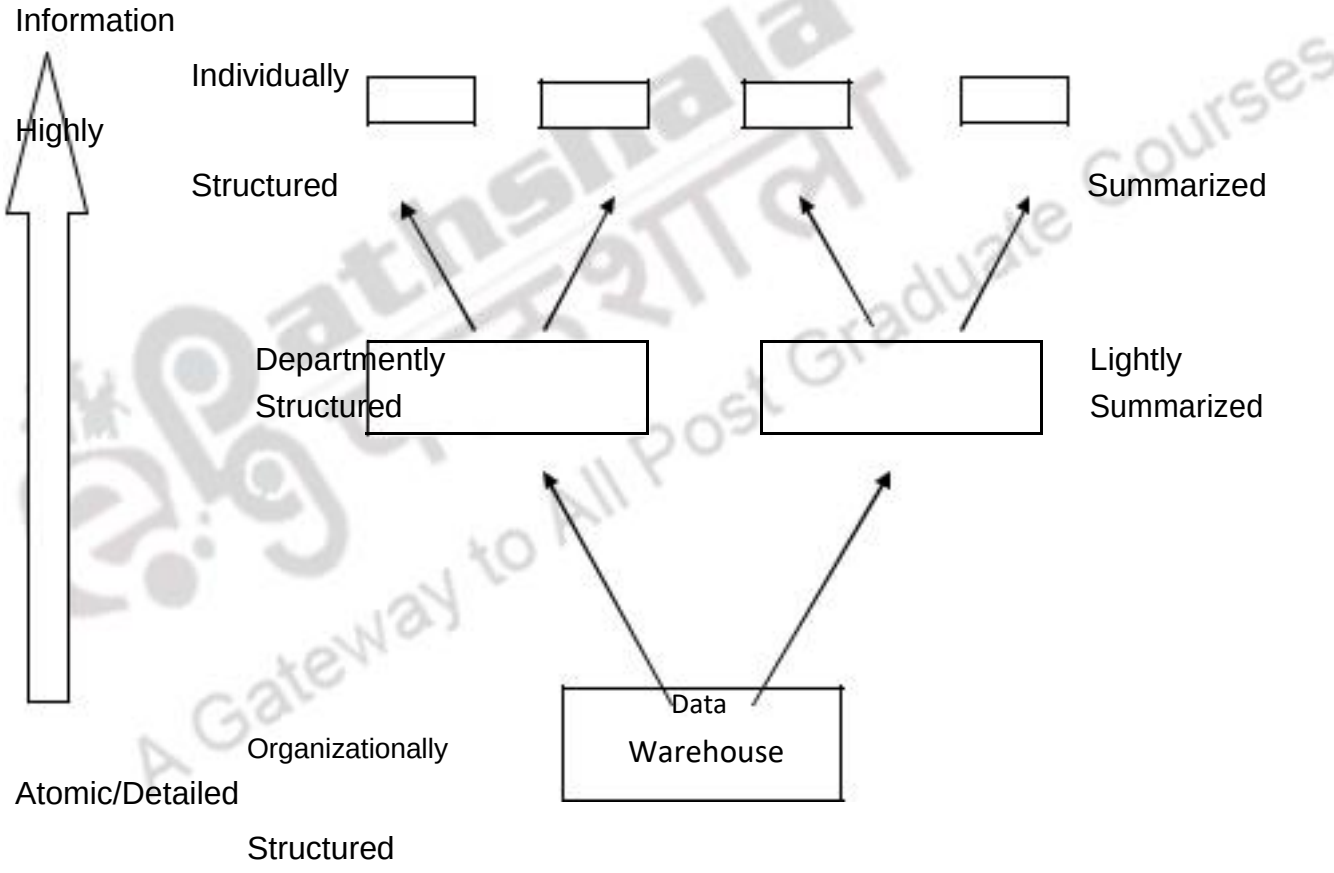
In computing Extract, Transform, Load (ETL) refers to a process in database usage and especially in data warehousing. The ETL process became a popular concept in the 1970s. Data extraction is where data is extracted from homogeneous or heterogeneous data sources; data transformation where the data is transformed for storing in the proper format or structure for the purposes of querying and analysis; data loading where the data is loaded into the final target database, more specifically, an operational data store, data mart, or data warehouse. Following figure shows ETL process:



9.1.3. Data Warehouse:

Data warehouse simply means a large store of data accumulated from a wide range of sources within a company and used to guide in management decisions. Data warehouse means storage of data from various sources which can be utilized later for analysis and decision making process.

Data warehousing emphasized the capture of data from diverse sources for useful analysis and access, but does not generally start from the point-of-view of the end user who may need access to specialized, sometimes local databases. The latter idea is known as the data mart.



Source: www.google.com Data Warehouse Structure

9.2 Visualization:

It includes geographical information system.

Geographical Information System (GIS) is a computer system for capturing, storing, checking and displaying data related to positions on Earth's surface. GIS can show many different kinds of data on one map. This enables people to more easily see, analyze, and understand patterns and relationships.

9.3 Strategy and Performance Management: It includes business performance management (BPM) and business activity management (BAM).

9.3.1. Business Performance Management (BPM):

Business performance management is a set of performance management and an analytic process that enables the management of an organization's to achieve one or more pre-selected goals. Business performance management is also known as corporate performance management (CPM) and enterprise performance management. Business performance management has three main activities.

a.. Selection of goals.

b. Measurement of progress of the organization against these goals.

c. Interventions made by managers in light of this information with a view to improving future performance against these goals.

9.3.2. Business Activity Management (BAM):

Business activity management is also known as business activity monitoring. Business activity management means proactively define and analyze opportunities and risks in an enterprise to maximize profitability and improving efficiency. Business activity management utilizes advanced technology for the same.

The term business activity monitoring was originally coined by analysts at Granter, Inc. It simply means aggregation, analysis and presentation of real-time information about activities inside organizations and involving customers and partners. The goals of business activity management are to provide real time information about the results and status of various operations, processes and transactions.

9.4. Reporting Status Tackling:

It involves online analytical processing and executive information system.

9.4.1. Online Analytical Processing (OLAP):

It is an approach to answering multi-dimensional analytical queries swiftly in computing. Multidimensional analysis is a data analysis process that groups data into two categories namely, data dimensions and measurements. The term OLAP was created as a slight modification of the traditional database term online transaction processing (OLTP). Typical applications of OLAP include business reporting for sales, marketing, management reporting, business process management (BPM), budgeting and forecasting, financial reporting and similar areas, with new applications coming up, such as agriculture.

9.4.1.1. Features of Online Analytical Processing (OLAP):

Following are the key features of online analytical processing.

a. Multidimensional views of data
b. Support for complex calculations
c. Time intelligence.

Multidimensional Views of Data:

A multi-dimensional view of data provides the basis for analytical processing through flexible access to corporate data. It enables users to analyze data across any dimension at any level of aggregation with equal functionality and ease.

Support for Complex Calculations:

It provides support for complex calculations because OLAP software provide a range of powerful computational methods.

Time Intelligence:

Time intelligence is used to judge the performance of almost any analytical application over time. For example, this month versus last month or this month versus the same month last year. These comparisons may be easily defined in an OLAP system.

9.4.1.2. Types of Online Analytical Processing:

Online analytical processing has three types namely, multidimensional online analytical processing, relational online analytical processing and hybrid online analytical processing.

Multidimensional Online Analytical Processing (MOLAP):

It is a traditional mode in OLAP analysis. In MOLAP data is stored in form of multidimensional cubes and not in relational databases. The advantage of this mode is that it provides excellent query performance and the cubes are built for fast data retrieval. All calculations are pre-generated when the cube is created and can be easily applied while querying data. The disadvantages of this model are that it can handle only a limited amount of data. Since all calculations have been pre-built when the cube was created, the cube cannot be derived from a large volume of data. This deficiency can be bypassed by including only summary level calculations while constructing the cube.

Relational Online Analytical Processing (ROLAP):

It is another important type of online analytical processing. The underlying data in this model is stored in relational databases. Since the data is stored in relational databases this model gives the appearance of traditional OLAP. The advantages of this model are it can handle a large amount of data and can leverage all the functionalities of the relational database. The disadvantages are that the performance is slow and each ROLAP report is an SQL query with all the limitations of the genre.

Hybrid Online Analytical Processing (HOLAP):

Hybrid online analytical processing technology tries to combine the strengths of the above two models. For summary type information HOLAP leverages cube technology and for drilling down into details it uses the ROLAP model.

It offers higher scalability of ROLAP and faster computation of MOLAP. HOLAP servers allow storing the large data volumes of detailed information.

9.4.2. Executive Information System:

An executive information system (EIS), also known as an executive support system (ESS), is a type of management information system that provides necessary information to the managers and helps them in decision making process. It provides easy access to internal and external information relevant to organizational goals. It is commonly considered a specialized form of decision support system (DSS).

In general, EIS are enterprise-wide DSS that help top-level executives to analyze, compare, and highlight trends in important variables so that they can monitor performance and identify opportunities and problems.

9.4.2.1. Components of Executive Information System:

EIS components can typically be classified as:

a. Hardware
b. Software
c. User Interface
d. Telecommunications

Hardware:

When talking about computer hardware for an EIS environment, we should focus on the hardware that meets the executive's needs. The executive's needs must be defined before the hardware can be selected. The basic hardware needed for a typical EIS includes four components:

a. **Input Data Entry Devices:** These devices allow the executive to enter, verify, and update data immediately.
b. **CPU:** CPU stands for Central Processing Unit. The central processing unit (CPU), is the most important component because it controls the other computer system components.
c. **Data Storage Files:** The executive can use this part to save useful business information, and this part also helps the executive to search historical business information easily.
d. **Output Devices:** Output devices are very important because executive can save their important data in these devices. They can utilise this information later. Output devices refers to the visual output device such as monitor or printer.

Software:

Appropriate software selection is vital for effective EIS. Therefore, the software components and how they integrate the data into one system are important. Following are the some pre-requisites for software selection:

The software must be text-handling software because documents are typically text based. The software must be graphic based because graphics can turn volumes of text and statistics into visual information for executives. Typical graphic types are: time series charts, scatter diagrams, maps, bar charts etc.

The software must be model based because models are very helpful in routine, statistical and financial analysis.

User Interface:

User interface simply means interaction between machine and human being. 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, command language, natural language and input/output.

Telecommunications:

As decentralizing is becoming the current trend in companies, telecommunications will play a pivotal role in networked information systems. Transmitting data from one place to another has become crucial for establishing a reliable network. Telecommunication made it easy to access the distributed data.

Advantages and Disadvantages of EIS:

Advantages:

Following are the main advantages of executive information system:

a. It is very easy to use. No extensive computer experience is required for operations.
b. It is helpful to provide necessary information on timely basis as per their requirements.
c. It increases efficiency of the decision makers.
d. It is helpful to save time b ecause it provides necessary information on time. Therefore, management can make decisions promptly.

Disadvantages:

Following are some disadvantages of executive information system:

a. All data and information are dependent upon system.
b. It incurs very high implementation cost.

c. System may become slow because a large amount of data is stored on it.
d. For small organization it is not possible to implement executive support system due to very high cost.

9.5. Business Analytics:

It includes text mining, data mining and web mining.

9.5.1. Text Mining:

Text mining is a process of analyzing huge text data to retrieve the information from it.

The basic measures for text retrieval are as under:

a. Precision: This is the percentage of retrieved documents that are in fact relevant to the query (i.e., “correct” responses).
b. Recall: This is the percentage of documents that are relevant to the query and were, in fact, retrieved. Recall is basically the formal definition of precision.

9.5.2. Data Mining:

It is the practice of examining large pre-existing databases in order to generate new information. Generally, data mining (sometimes called data or knowledge discovery) is the process of analyzing data from different perspectives and summarizing it into useful information – information that can be used to increase revenue, cuts costs, or both. Data mining software is one of a number of analytical tools for analyzing data. It allows users to analyze data from many different dimensions or angles, categorize it, and summarize the relationships identified.

9.5.3. Web Mining:

Web mining means mining World Wide Web (WWW). The WWW is a huge, widely distributed, global information service center for news, advertisements, management, education, government, and many other information services. The Web also contains dynamic collection of hyperlink information and web page access.

9.5.3.1. Challenges in Web Mining:

Following are some challenges in Web mining:

a. The Web seems to be too huge. Therefore, data warehousing and data mining is very difficult.

b. The Web is a highly dynamic source of information. Only a small portion of the information on the Web is useful or relevant.

10. Why Companies use Computerized Decision Support System:

Following are some reasons for that company want to use computerized decision support system.

a. Changing economy.
b. Many business operations.
c. Global competition.
d. E-commerce.
e. For prompt decision making.
f. For higher decision quality.
g. To improve productivity.

Summary:

Active Decision Support System: Active decision support system is a system which brings explicit solutions to the problems arises in decision making process.

Cooperative Decision Support System: A cooperative decision support system allows for an iterative process between human and system towards the achievement of a consolidated solution.

Data: As we know decision support system provides solutions to the problems. Every problem requires data from many sources.

Database: A database is an organized collection of data.

DBMS: Database management system (DBMS) is a computer software application that interacts with the user, other applications, and the database itself to capture and analyze data.

DSS: DSS stands for Decision Support System. It is a system of decision making and problem solving.

Model: Models are used to manipulate data. Models may be standard or customized.

OODBMS: It stands for Object Oriented Database Management System.

Passive Decision Support System: A passive decision support system is a system that aids in the process of decision making, but that cannot bring out explicit decision solutions or suggestions.

RDBMS: It stands for Relational Database Management System. In relational database management system data is structured in tables, fields and records.

Progress Check:

Question 1: What do you understand by Decision Support System?

Question 2: Explain different characteristics of Decision Support System?

Question 3: What is Database Management System? Explain different types of DBMS?

Question 4: Explain different computerized tools used in DSS?

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