#### 6.0 DECISION SUPPORT SYSTEMS

A decision support system (DSS) is a computer-based information system that supports business or organizational decision-making activities. DSSs serve the management, operations, and planning levels of an organization and help to make decisions, which may be rapidly changing and not easily specified in advance. DSSs include knowledge-based systems. A properly designed DSS is an interactive software-based system intended to help decision makers compile useful information from a combination of raw data, documents, personal knowledge, or business models to identify and solve problems and make decisions.

Typical information that a decision support application might gather and present are:

- inventories of information assets (including legacy and relational data sources, cubes, data warehouses, and data marts),
- comparative sales figures between one period and the next,
- Projected revenue figures based on product sales assumptions.



Figure 6.1: Decision Support System

#### 6.1 Taxonomy

As with the definition, there is no universally-accepted taxonomy of DSS either. Different authors propose different classifications. Using the relationship with the user as the criterion, Haettenschwiler differentiates,

• Passive DSS

- Active DSS
- Cooperative DSS

A **passive DSS** is a system that aids the process of decision making, but that cannot bring out explicit decision suggestions or solutions.

An active DSS can bring out such decision suggestions or solutions.

A **cooperative DSS** allows the decision maker (or its advisor) to modify, complete, or refine the decision suggestions provided by the system, before sending them back to the system for validation.

Another taxonomy for DSS has been created by Daniel Power. Using the mode of assistance as the criterion, Power differentiates communication-driven DSS, datadriven DSS, document-driven DSS, knowledge-driven DSS, and model-driven DSS.

- A communication-driven DSS supports more than one person working on a shared task; examples include integrated tools like Microsoft's NetMeeting or Groove
- A data-driven DSS or data-oriented DSS emphasizes access to and manipulation of a time series of internal company data and, sometimes, external data.
- A **document-driven DSS** manages, retrieves, and manipulates unstructured information in a variety of electronic formats.
- A **knowledge-driven DSS** provides specialized problem-solving expertise stored as facts, rules, procedures, or in similar structures.
- A model-driven DSS emphasizes access to and manipulation of a statistical, financial, optimization, or simulation model. Model-driven DSS use data and parameters provided by users to assist decision makers in analyzing a situation; they are not necessarily data-intensive. Dicodess is an example of an open source model-driven DSS generator.

## 6.2 Components of DSS

Three fundamental components of DSS architecture are:

- 1. the database (or knowledge base)
- 2. the model (i.e., the decision context and user criteria)
- 3. the user interface

The users themselves are also important components of the architecture.

DSS components may be classified as:

1. Inputs: Factors, numbers, and characteristics to analyze

- 2. User Knowledge and Expertise: Inputs requiring manual analysis by the user
- 3. Outputs: Transformed data from which DSS "decisions" are generated
- 4. Decisions: Results generated by the DSS based on user criteria

# 6.3 Application

As mentioned above, there are theoretical possibilities of building such systems in any knowledge domain.

- One example is the clinical decision support system for medical diagnosis. Other examples include a bank loan officer verifying the credit of a loan applicant or an engineering firm that has bids on several projects and wants to know if they can be competitive with their costs.
- DSS is extensively used in business and management. Executive dashboard and other business performance software allow faster decision making, identification of negative trends, and better allocation of business resources.
- A growing area of DSS application, concepts, principles, and techniques is in agricultural production, marketing for sustainable development. For example, the DSSAT4 package,[15][16]developed through financial support of USAID during the 80's and 90's, has allowed rapid assessment of several agricultural production systems around the world to facilitate decision-making at the farm and policy levels. There are, however, many constraints to the successful adoption on DSS in agriculture.[17]
- DSS are also prevalent in forest management where the long planning time frame demands specific requirements. All aspects of Forest management, from log transportation, harvest scheduling to sustainability and ecosystem protection have been addressed by modern DSSs. A comprehensive list and discussion of all available systems in forest management is being compiled under the COST action Forsys
- A specific example concerns the Canadian National Railway system, which tests its equipment on a regular basis using a decision support system. A problem faced by any railroad is worn-out or defective rails, which can result in hundreds of derailments per year. Under a DSS, CN managed to decrease the incidence of derailments at the same time other companies were experiencing an increase.

### 6.4 Benefits

- Improves personal efficiency
- Speed up the process of decision making
- Increases organizational control
- Encourages exploration and discovery on the part of the decision maker
- Speeds up problem solving in an organization
- Facilitates interpersonal communication
- Promotes learning or training
- Generates new evidence in support of a decision
- Creates a competitive advantage over competition
- Reveals new approaches to thinking about the problem space
- Helps automate managerial processes