THE DECISION SUPPORT SYSTEMS FOR THE INFORMATION SOCIETY (i-Society)

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Abstract

The globalization process needs exact information flows that should be collected in due time. The Information Society ensures the communication between people with different expertise from various geographical areas that have similar interests. The increase of the companies' activities leads implicitly to the increase of the volume and the complexities of databases, as well as the continuous modernization of the integrated information systems in order to collect the information in due time, that is requested by the decision takers and the frequent use of DSS. The paper presents the DSS structure, the main facilities offered by the associated software products, an evolution of the databases technologies, as well as a list of the program products used to process the statistical data and data mining in order to obtain the main sources of information that is necessary to take decisions.

Keywords: Information Society (i-Society); Data Base; Information Systems; Decision Support Systems (DSS); Statistical Package, Portal technology;

Introduction

The Information Society (i-Society) is a global knowledge-enriched collaborative effort that has its roots from both academia and industry, with the intention of bringing people with similar interests, but different areas of expertise together. The i-Society bridges the gap between academia and industry with regards to research collaboration and awareness of current development in secure information management in the digital society. The i-Society include the following areas: : Intelligent data management, Secure Technologies, e-Learning, e-Health, e-Governance, e-Business, e-Art, e-Science, Industrial developments.

In the 1960s, researchers began systematically studying the use of computerized quantitative models to assist in decision making and planning. Ferguson and Jones (1969) reported the first experimental study using a computer aided decision system. By April 1964, the development of the IBM System 360 and other more powerful mainframe systems made it practical and cost-effective to develop Management Information Systems (MIS) for large companies. These early MIS focused on providing managers with structured, periodic reports and the information was primarily from accounting and transaction processing systems, but the systems did not provide interactive support to assist.

The Decision Support System (DSS) is a class of information systems that support business and organizational decision-making activities. 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

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models to identify and solve problems and make decisions. In generally a DSS is a computer system providing both problem solving and communications capabilities for semi-structured /unstructured problems [Source [1], [2],[3]]. Basic characteristics of DDS (see fig. no.1) .

An Executive Information System (EIS) is a set of management tools supporting the information and decision-making needs of management by combining information available within the organization with external information in an analytical framework.

Executive Support System (ESS) is a reporting software tool that allows you to turn your organization's data into useful summarized reports. These reports are generally used by executive level managers for quick access to reports coming from all company levels and departments such as billing, cost accounting , staffing, scheduling, and more. A ESS (or DSS more in general) is a software system under control of one of many decision-makers that assists in their activity of decision making by providing and organized set of tools intended to impart structure to portions of the decision making situation and to improve the ultimate effectiveness of the decision outcome". Recent developments on ESS and DSS tend to integrate the multiple decisions being taken by the institution, so they become Organizational Decision Support System(ODSS). An ODSS is therefore a participative process, instead of a mandatory product. In the fig. no.1, the circle represents the domain area of a typical Executive Support System.
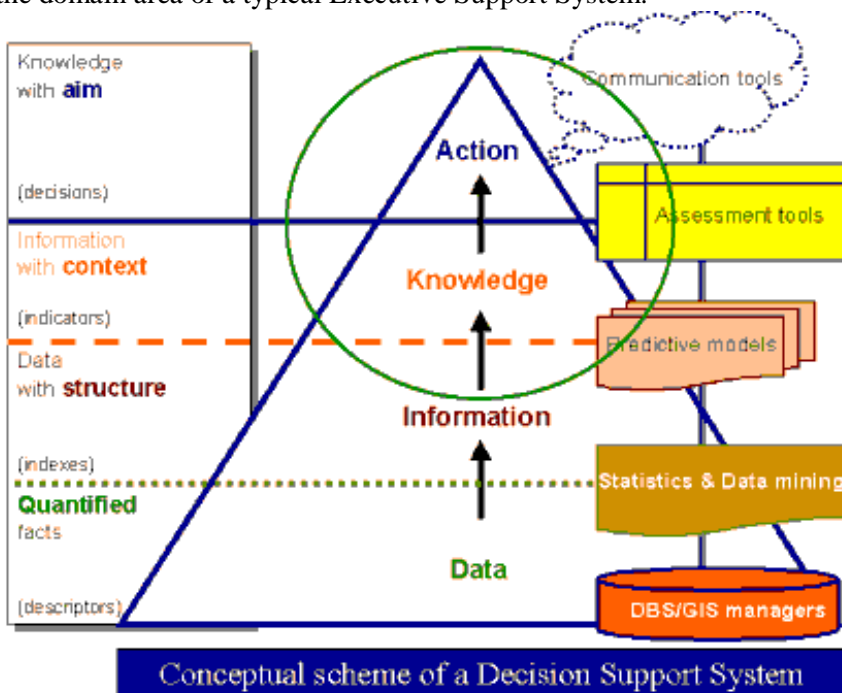

Figure no. 1 Conceptual scheme of a Decision Support System [Source [3]]

Structure of a ODSS package

In generally a ODSS is a computer system providing both problem solving and communications capabilities for semi-structured /unstructured problems [Source [1], [2],[3]]. Basic characteristics of ODDS are(see fig. no.2):

- Used by managers (or decision makers);
- Used in making decisions;
- Used to support, not to replace, people;
- Used when the decision is semi-structured or unstructured;
- May incorporate database of some sort;
- May incorporate models;

Decision Support System Advantages:
- Improve Personal Efficiency;
- Expenditure Problem Solving;
- Facilitate Impersonal Communications;
- Promote learning or training;
- Increase Organizational Control.

Typical information that a decision support application might gather and present are:
- an inventory of all of your current information assets (including legacy and relational data sources, cubes, data warehouses, and data marts),
- comparative sales figures between one week and the next,
- projected revenue figures based on new product sales assumptions
- accessing all of your current information assets, including legacy and relational data sources, cubes, data warehouses, and data marts
- The consequences of different decision alternatives, given past experience in a context that is described

Decision analysis is a general phrase describing the broad application of modeling and simulation techniques for improving decision-making. The ODSS package combines all of the most powerful and essential quantitative methods in management with features of spreadsheets, artificial intelligence tools, and math applications to produce an advanced business modeling system. The specific capabilities include:

- **Forecasting:** extrapolating historical performance data to aid in planning.
- **Monte Carlo Simulation:** modeling uncertainty to help manage business risk and simulate complex systems.
- **Decision Tree Analysis:** choosing the best course of action when future outcomes are uncertain.
- **Sensitivity Analysis:** determining which assumptions drive your decisions most.
- **Optimization:** finding the best solution to very complex problems subject to business constraints.
- **General Modeling and Problem Solving:** tackling logically complex problems and communicating your ideas clearly.

> ➢ **Data Analysis:** pulling valuable information from historical or experimental data.
> ➢ **Advanced Analytics:** building models that push the envelope in state-of-the-art business analysis.
> ➢ **Application Development:** building mission-critical applications based on Vanguard.

Benefits / Features

- **Collaboration:** Many individuals simultaneously contribute to a modeling effort. Like building blocks, easily combine their knowledge, assumptions, and historical data into complete models.
- **Roll up / Drill down:** Roll-up your analysis to see high-level views, or drill down into specific areas of a model for greater detail and understanding.
- **Go beyond data:** When historical data is scarce, Vanguard knows how to interpret your management estimates, assumptions, and uncertainties.
- **Instant Web reports:** With a few clicks, Vanguard turns models into interactive Web reports. Access your models anytime from anywhere, fully exercise the models in real time, and distribute your results to everyone who needs them.
- **Real-time results:** Rest assured you always have the latest results. Vanguard automatically updates your models as changes are made in any component.
- **Open and transparent:** Models are displayed graphically and use plain English formulas making them easy to communicate to colleagues, management, or clients. Anyone can quickly review assumptions, gain insight into your results, and provide feedback.
- **Easy integration:** Vanguard integrates directly with your existing business systems such as databases, enterprise applications, and even spreadsheets.
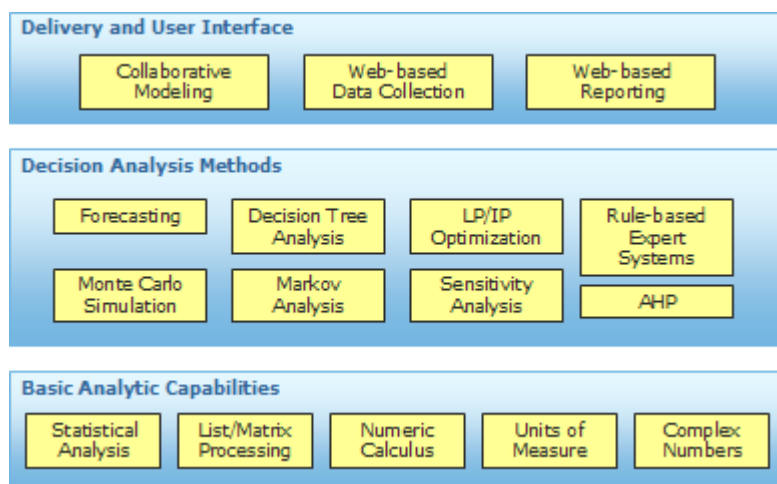

Figure no. 2. The layered capabilities architecture of the ODSS Package

DATABASES AND INFORMATION SYSTEMS INTEGRATION

The globalization phenomenon of the worlds' economy has led to the increase of the volume, complexity and the work speed so relevant to all the information flows in all the

fields. The researches undertaken and all the results in IT&C have led to the elaboration of new technologies for the administration of data bases (see fig. no. 3) and their integration into reliable information systems. In this respect, there were identified the following research stages through which significant results have been produced:

Coupling and Integrating Heterogeneous Data Sources
- ➢ Enterprise Resource Planning
- ➢ Middleware Integration
- ➢ Legacy Systems
- ➢ Organizational Issues on Systems Integration
- ➢ Distributed Database Applications
- ➢ Object-Oriented Database Systems
- ➢ Enterprise-Wide Client-Server Architecture
- ➢ Database Security and Transaction Support
- ➢ Data Warehouses
- ➢ Multimedia Database Applications
- ➢ Web Databases
- ➢ Mobile Databases
- ➢ Software Engineering
- ➢ Software Measurement AREA

Statistical Analysis and Data Mining
The statistical processing of the experimental data collected from the object system represents the main source of information to establish the decisions of each decisional process. The increase of the object system's activity leads implicitly to the increase of the volume and the complexity of processing the statistical data, and the collection of information in due time, which is requested by the decision takers, needs modern technologies of data mining and the statistical processing of these experimental data through efficient software products, some of them can be accessed at no charge by a wide range of users.

The list of the free software packages that may be download and install for stand-alone (offline, non-Internet) computing there is in : www.StatPages.net and www.statpages.org/javastat2.html.

This packages are presented under the following general headings:
- General Packages: support a wide variety of statistical analyses;
- Subset Packages: deal with a specific area of analysis, or a limited set of tests;
- Curve Fitting and Modeling: to handle complex, nonlinear models and systems;
- Biostatistics and Epidemiology: especial useful in the life science;
- Survey, Testing and Measurement: especially useful in the business and social sciences;
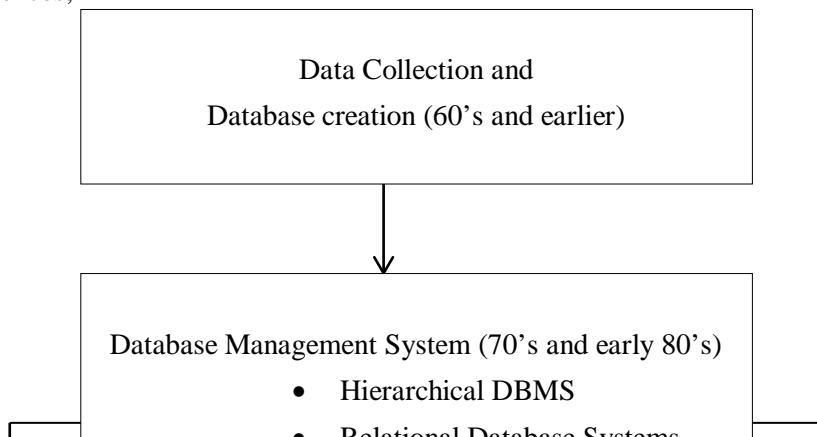
Data Collection and

Database creation (60's and earlier)

Database Management System (70's and early 80's)

- Hierarchical DBMS

- Relational Database Systems

Figure no 3.   The evolution. Database Technologies

- Excel Spreadsheets and Add-is: you need a recent version of Excel

- Programming Languages and Subroutine Libraries: customized for statistical calculations,   you need learn the appropriate syntax;
- Script and Macros: for scriptable , like SAS, SPSS, R, etc.;
- Miscellaneous: don't fit into any of the other categories;
- Other Collections of Links to Free Software

Data mining, through the methods and its specific techniques, offers relevant statistical sources of data. Among the activities specific to this domain we enumerate:

- *classification* (examining the feature of a newly presented object and assigning it to one of a predefined set of classes);
- *estimation* (given some input data, coming up with a value for some unknown continuous variable such as income, height, or credit-card balance);
- *prediction* (the same as classification and estimation except that the records are classified according to some predicted future behavior or estimated future value);
- *affinity grouping or association rules* (determine which things go together, also known as dependency modeling, e.g. in a shopping cart at the supermarket - market basket analysis);
- *clustering* (segmenting a population into a number of subgroups or clusters); and
- *description and visualization* (exploratory or visual data mining).
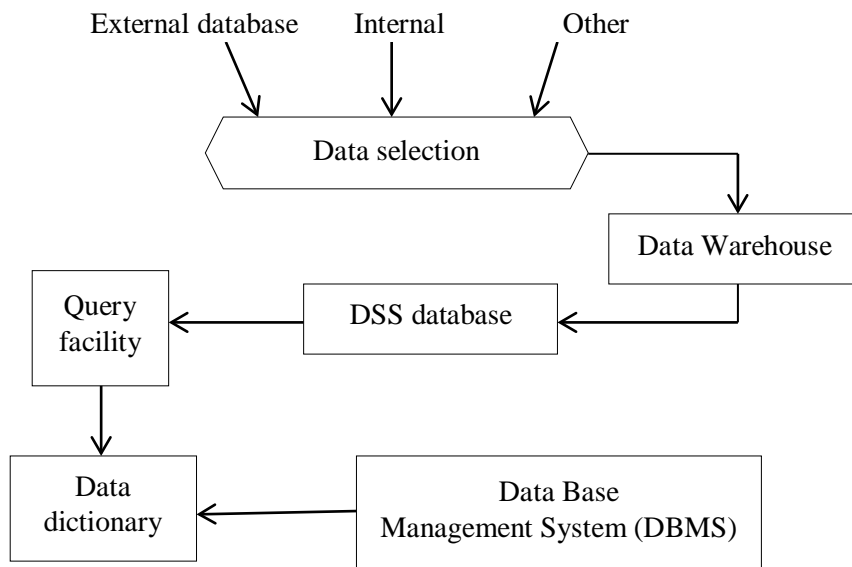

Figure no 4.   Data management module

Conclusions

The increase of the companies' volume of activities and the speed of the material and financial flows imposes the use, on a large scale, of modern means in order to collect and process the IT&C data, especially ESD, ISS and DSS. For ESD, ISD and SSD to have access to data in due time, it is needed a continuous improvement of the SGBD performances and the used information systems. The statistical processing of the

experimental data collected from the company and outside the company and their stocking as databases, represents the main source of information to establish the decisions. The researches undertaken during the '90s identified five types of DSS as follows: text-oriented DSS, database-oriented DSS, spreadsheet-oriented DSS, solver-oriented DSS, and rule-oriented DSS, and the researches undertaken in the first decade of this century outlined seven subgroups as follows: personal DSS, group support systems, negotiation support systems, intelligent DSS, knowledge management-based DSS, executive information systems/business intelligence, and data warehousing.

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