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THE DECISION SUPPORT SYSTEM IN ROMANIA

Theoretical article

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Abstract

In the present paper we will try to analyze the Decision Support System (DSS) and the way in which it is applied or not in the Romanian Small and Medium Sized Enterprises (SMEs) (with examples). We also will see if the system is beneficial for these Romanian Enterprises.
We analyzed through interviews 50 small and medium-sized Romanian enterprises. They do not accept their name to be published. As a consequence, we will present only the results.
It is underlined in the conclusions the differences between the small and the medium size enterprises in respect of the models they are using.
The most important benefits of DSS (generally) are represented by increased efficiency, competitive advantages and better managerial process.

The Concept of DSS

DSS were introduced in the 1970s and gain attention in the 1980s. They were perceived as an evolutionary step from the management information systems (Power, 2007).

The main components of the DSS architecture are the database, the model and the user interface. These components can be classified as Inputs, User Knowledge and Expertise, Outputs, Decisions.

DSS systems are not entirely different from other systems. They require a structured approach including technology, people and the development approach.

The **Decision Support System (DSS)** represents a sort of information system which is a support for business and organizational decision-making activities. If it is properly designed, it is an interactive software-based system in order to help decision makers to compile useful information from a combination of documents, data, and business models, to identify and solve problems and take decisions. They were perceived as an evolutionary step from management information systems, which at the time were relatively inflexible storehouses of corporate data.

The most common information presented by a DSS is as follows:

- ✓ an inventory of all current information assets;
- ✓ comparative sales figures between one week and the next;
- ✓ projected revenue figures based on new product sales assumptions.

According to some authors the concept of decision support evolved from two main areas of research, namely the organizational decision making studies made at the Carnegie Institute of Technology during the late 1950s and early 1960s and the technical work on interactive computer systems, carried out mainly by the Massachusetts Institute of Technology in the 1960s. The concept of DSS gained more interest in the 1980s.

Late 1980s DSS models evolved to the executive information systems (EIS), group decision systems (GDSS) and organizational decision support systems (ODSS). According to Sol (1987) both the definition and the scope of DSS migrated over the years. If in 1970s DSS was defined as a "computer-based system to aid decision making" at the end of the 1980s it faced new challenges towards the design of intelligent workstations.

There is no universal-accepted **taxonomy** of DSS because different authors proposed various definitions and classifications. Haettenschwiller, using the criterion of the relationship with the user, differentiated *passive, active and cooperative DSS*. A passive DSS is a system that aids the decision-making process, but it is not able to get decision suggestions or solutions. An active DSS is able to bring out such solutions. A cooperative DSS is allowing the decision maker to complete, modify and refine the decision suggestions proposed by the system, than the system completes, improves and refines the suggestions and send them back to the decision maker in order to be validated.

D.Power (2007), using the mode of assistance criterion, differentiated: communication-driven, data-driven, document-driven, knowledge-driven and model-driven DSS. A communication-driven DSS supports more than one person to work on a shared task (see Microsoft's NetMeeting or Groove). A data-driven DSS put the accent on the access to and the manipulation of time series of internal data and, sometimes, external data. A document-driven DSS is managing, retrieving and manipulating unstructured information in a large variety of electronic formats. A knowledge-driven DSS provides specialized problem-solving expertise stored as facts, procedures, rules

etc. A model-driven DSS emphasizes access to and manipulation of statistical, financial, optimization and simulation models. It uses data and parameters provided by users in order to assist decision makers in analyzing a situation.

Components and Models of DSS

There are **three main components of the DSS architecture** as follows:

1. the database;
2. the model;
3. user interface.

Of course, the DSS systems are not entirely different from other systems, but their technology levels may include:

- the actual application that will be used by the user;
- generator contains hardware/software environment that allows people to develop easily specific DSS applications;
- DSS generators including special languages, functional libraries, linking modules etc.

The DSS can be changed and redesigned at various intervals and once the system is designed it needs to be tested and revised according to the desired outcomes.

DSS components can be classified as follows:

- Inputs – numbers, factors and characteristics to be analyzed;
- User knowledge and expertise – inputs requiring manual analysis by the user;
- Outputs – transformed data from which the decisions are generated;
- Decisions – results generated by the system based on user criteria.

DSS performing selected cognitive decision-making functions and based on artificial intelligence are called Intelligent Decision Support Systems or IDSS.

A Data analysis system provides access to data, allows data manipulation capabilities uses the information in order to offer alternatives. The Analysis information systems combine information from several files, some of them external, can have a true data base; the information can be combined in order to answer a specific query. The Accounting models are using internal accounting data, provide accounting modeling capabilities but cannot handle uncertainty. The Representational model can incorporate uncertainty, is using models to solve decision problems, can be used to augment the capabilities of the Accounting models, and uses the demand data to forecast next year demand and the results to make inventory decisions.

The Optimization systems are used to estimate the effects of various decision alternatives can incorporate uncertainty etc. The Suggestion systems are descriptive and prescriptive models, used to suggest to the decision-maker the best possible action; they may incorporate an Expert System, are using the system to recommend a decision.

The Group Decision Support Systems (GDSS) (Reference for Business, 2010) are used to assist groups of decision makers who have common or overlapping responsibilities. One example is tallying and processing group member preferences and presenting the output for the participants to discuss. In some cases the group may never meet but there is a centralized system available to each member for the common tasks they have to perform.

Executive Information Systems (EIS) are analysis tools meant to be applied to most critical financial and performance data of a company. There was a resurgence of the EIS in the 1990s due to the widespread of management interest in activity-based costing, data warehousing and company resource planning systems. Software made EIS less costly and more powerful.

As categories of DSS one can take into account various criteria:

Based on the **nature of the decision situation** we have:

✓ Institutional DSS – they are regularly used, are taking into account the nature of the organization and are used by more than one person;

✓ Ad-Hoc DSS – they are one of a kind, used one time and by single individuals.

Based on **number of users** the DSS are:

- Individual
- Multi-individual
- Group

Strategy is extremely important for any company. Nowadays, **strategic planning** is very important for some companies but for others is employed only to:

- Glimpse future opportunities;
- Determine the economic impact and risks of investment choices;
- Take defensive steps to reduce threats facing the company;
- Match resources and capabilities to the competitive environment;
- Capitalize on opportunities and emerging trends;
- Establish a set of standards and direct resources toward goals in areas such as sales, growth, profit, productivity, service etc.

The **Integrated Business Planning (IBP)** (Centurion, 2009) is a mean for the organizations which are already efficient to be different from their competition. By implementing IBP across the company, the departments can engage in planning processes that inform the plans of other areas of the business, including linking the strategy to budgeting and operational planning. In this situation, the decision-makers can evaluate uncertainty, use effectively historical data, simulate complex systems and allocate optimally scarce resources.

This multi-dimensional business modeling enables managers to project the financial outcomes of potential plans or actions because it offers:

- More insights through: "what-if" analysis, simulation analysis, optimization to any variable or objective function, infeasibility and "next best alternative";
- More impact through: full set of metrics, resource allocation guidelines, alignment of targets and incentives;
- More flexibility through: fast structuring and analysis of scenarios with multiple variables, easy to store, retrieve, analyze and share.

Best practice organizations are using the IBP strategy model as a core planning driver for operational planning, sales and operations planning, forecasting and financial budgeting.

A new application is the **software for visualizing the past, present and the future**. (Alper, Brown and Wagner, 2006) Visualization technology and applications can be put into three categories:

1. visual discovery of insights hidden in historical data bases;
2. visual presentation of the current state of the organization;
3. visual simulation of futures alternative.

The categories are not unique because category one has some similarities with category two, which has also similarities with category three. Category one has little or no similarity with category three.

Tableau® builds tools designed for visual analysis in support of business intelligence and enables anyone in the organization to better analyze business data using their natural ability to think visually. Tableau is designed to support the cycle of analysis and the exploration is easy.

Crystal Xcelsius© is an easy-to-use desktop application that creates highly interactive, data-rich dashboards linked to Excel data or corporate databases. The interface is simply to learn and should be intuitive for users familiar with building charts with Excel because there are no programming or technical skills required. The Standard and Professional editions are lightweight, low priced applications that

provide considerable design power to Excel users, the workgroup edition provides links to a variety of companies data sources and the ability to develop powerful dashboards with real-time data links and extensive data drill-down.

The Planners Lab© is important for simulating and visualizing the future. The software has two main components, namely: an easy to learn and use assumption description language and an intuitive and easy to drag and drop visualization. The product facilitates conversation like interactions with decision makers while they describe their business assumptions. The assumptions, which are not so visible in the decision-making processes, are often more important than the numbers. It is considered that no other product supports such understandable participation by decision makers in creating assumptions that generate the numbers. The sources of assumptions can be from market research, databases, decision maker minds, surveys, accumulated experiences in the form of opinions for the decision maker regarding the future.

After creating a model the user is continuing the discovery and learning process by visualizing results and asking what if and goal seek questions. The "what if feature" is designed for making temporary changes in the model's logic and seeing the effects of those changes. Goal seek asks the question "what does the value of one variable need to be *moved to* in order to achieve a desired goal value in another variable?" The impact feature asks the question "what impact does x% change in what if variables have upon a goal variable?"

Risk analysis is for measuring uncertainty. The software is a client server network enabled product and can interact with databases to extract historical data from packages such as Excel for instance. It can provide data for Xcelsius charts. The Planners Lab software is the starting point to achieve the vision that business software should provide decision makers with experiences such as are currently available in computer gaming because decision makers should have comparable feedback experience with software-based strategy simulators.

The **Automated Decision Support (ADS)** systems are able to provide automatically solutions to repetitive management problems. They are closely related to business analysis and business informatics. ADS systems are useful in situations requiring solutions to repetitive management problems using electronically available information. The problem situation should be very clear and well understood. There are components to ADS systems provided by software companies such as:

- rules engines;
- mathematical and statistical algorithms;
- industry-specific packages;
- enterprise systems;
- workflow applications.

Results

As everybody knows, Romania started to move towards the market economy after 1990. In these conditions it was difficult, at first, to have a lot of SMEs due to the lack of capital, of performing management and of the suited economic culture. Nowadays the number of this kind of enterprises is continually growing, they become more and more efficient and aware of the necessity of using modern tools in order to raise their profits, including the DSS.

We analyzed 50 small (25) and medium-sized (25) enterprises from Romania. They do not accept their name to be published. As a consequence, we will present only the results. The small size enterprises are mainly using the accounting models (15 from 25); others are using data-driven DSS models (5 from 25) or model-driven DSS (5 from 25). I believe that they are using accounting models due to the availability of data and of lower costs.

The medium size enterprises are using: Integrated Business Planning (3 from 25), Tableau (4 from 25), model-driven DSS and ADS (10 from 25), accounting and representational models (8 from 25). The preference for ADS systems is due to the fact that they refer to repetitive management problems.

The analysis was done by interviews (informal) and the managers were interested in using more the DSS in order to raise performance. Still, no company used Planners Lab, a fact that we found a little bizarre because it is a very efficient model.

All the people we interviewed signaled the benefits of the DSS as mentioned in the theoretical part of the paper and are interested in introducing new models in the future in order to raise productivity, efficiency and profits.

Conclusions

DSS has various applications and can be used in any field where we need organization. It can also be designed to help make decisions on the stock market or on deciding which product should be produced according to the market.

The benefits of the DSS are:

- The improvement of the personal efficiency;
- Speeding up the progress of problem solving in an organization;
- Facilitating interpersonal communication;
- Increasing the organizational control;
- Generating new evidence in support of a decision;
- Creating competitive advantages;
- Encouraging exploration and discovery on the part of the decision maker;
- Revealing new approaches to thinking about the problems
- Helping the managerial process etc.

Romania needs the use of DSS on a larger scale but for this to happen substantial investments are absolutely necessary. Nowadays, the problem is that the crisis is almost stopping investments in this kind of models.

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