DECISION SUPPORT SYSTEMS OR BUSINESS INTELLIGENCE: WHAT CAN HELP IN DECISION MAKING?

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Abstract
The world of tools supporting decision-making is very broad and full of confusing buzzwords. In this paper, we will focus on two basic types of software solutions that can be used to support decision making; DSS-decision support systems and BI-business intelligence.

1. Introduction

Decision making is the process of developing and analyzing alternatives to make a *decision* - a choice from the available alternatives. Most decisions are made in response to a *problem* - a discrepancy between a desirable and an actual decision and involve *judgment* - the cognitive aspects of the decision-making process. Decisions can be classified as either programmed or non-programmed.

Programmed decisions are repetitive or routine and can be solved through clear-cut mechanical procedures, such as applying the rules to find the best solution. Up to 90 percent of management decisions are programmed.

Non-programmed decisions are exceptional or nonrecurring, and they are often made under crisis conditions which involve so much ambiguity that specific procedures or programs are not available. Therefore, managers who must make non-programmed decisions rely on judgment, creativity, and intuition.

Although each group of decisions is specific in domain and time demandingness, we can find common principles and tools for making better decisions. Any manager can use the following techniques to overcome the barriers to effective decision making:

- *Increase knowledge*. A lack of experience with the problem at hand can cause anyone to make poor decisions.
- *De-bias judgment*. De-biasing judgment requires four steps: (1) understand that the possibility of bias exists, (2) understand how bias can affect judgment, (3) analyze previous decisions to determine how bias may have affected them, and (4) accept that while biases exist they can be minimized through diligence.
- *Be creative*. Creativity is the process of developing original, novel responses to a problem. It is essential for decision-making activities, such as discovering alternatives or defining problems. Creativity can be cultivated by checking assumptions and thinking through the process, step-by-step.
- *Use intuition*. Intuition can be defined as a cognitive process whereby we unconsciously make a decision based on accumulated knowledge and experience.
- *Don't overstress the finality of the decision*. Very few decisions are forever; there is more "give" in decisions than we realize.

- *Make sure the timing is right.* Managers should not let their decisions be swayed by passing moods.

2. Possible tools

From the common point of view most computer systems support decision making because all software programs involve automating decision steps that people would take. In the mainframe era, the earliest commercial uses of computers aimed to automate such decisions as analyzing sales, updating accounts payable, calculating payroll payments, and recording credit card charges and payments. Since those early days in the 1950s and 1960s, use of computers to support decision making has become increasingly sophisticated, either completely taking over complex decisions or supporting people who make complex decisions.

The world of tools supporting decision-making is very broad and full of confusing buzzwords. Existing definitions differ in the meaning according to time period when they were invented. There are also no unique and precise descriptions concerning necessary functionality for each type. This situation is even worse due to software companies mistaking one tool for another. In this paper, we will focus on two basic types of software solutions that can be used to support decision making; DSS-decision support systems and BI-business intelligence.

Table 1: Comparison of business intelligence and decision support system

"Whatis.com" Definitions	
Business Intelligence	**Decision Support System**
Business Intelligence (BI) is a broad category of applications and technologies for gathering, storing, analyzing, and providing access to data to help enterprise users make better business decisions.	*A decision support system (DSS) is a computer program application that analyzes business data and presents it so that users can make business decisions more easily.*

The key similarity in these two definitions is "making business decisions", and in particular both concepts are focused on helping to make these decisions in a better and easier way. The other important similarity is they both involve decision making "based on data". Nevertheless the question is what the difference between them is.

2.1. DSS - decision support systems

During the 1970s and 1980s, the concept of decision support systems (DSS) grew and evolved out of two previous types of computer support for decision making. One was management information systems (MIS), which provided (1) scheduled reports for well-defined information needs, (2) demand reports for ad hoc information requests, and (3) the ability to query a database for specific data. The second contributing discipline was operations research/management science (OR/MS), which used mathematical models to analyze and understand specific problems.

The definition of DSS, which has evolved since the 1970s and prevails today, was described in *Building Effective Decision Support Systems*, by Ralph Sprague and Eric Carlson [1]. They define DSS as:

- Computer-based systems
- That help decision makers
- Confront ill-structured problems
- Through direct interaction
- With data and analysis models.

This definition can be taken from the narrow or broad point of view. The narrow view shows the DSS as a system that essentially solve or give options for solving a given problem. The decision process is structured in a hierarchical manner, the user inputs various parameters, and the DSS essentially evaluates the relative impact of doing *x* instead of *y*. The broader definition incorporates the above narrow definition but also includes other technologies that support decision making such as knowledge or information discovery systems, database systems, and geographic information systems (GIS).[2, 3, 4, 5]

This article prefer the broader perspective and accept DSS in terms of their primary driving source of information. Power [6] suggested the following broad categories:

- Data driven DSS – includes file drawer and management reporting systems, data warehousing and analysis systems, Executive Information Systems (EIS) and Geographic Information Systems (GIS). Data-Driven DSS emphasize access to and manipulation of large databases of structured data and especially a time-series of internal company data and some times external data.

- 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 modelling, 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.

- 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. Data Mining tools can be used to create hybrid Data-Driven and Knowledge-Driven DSS.

- 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. A search engine is a powerful decision-aiding tool associated with this type of DSS.

- Communication driven and group DSS – where communication driven DSS includes communication, collaboration and coordination and GDSS focus on supporting groups of decision makers to analyse problem situations and performing group decision making tasks.

2.2. BI – business intelligence

Business intelligence is a new term in information technology. The meaning of business intelligence differs from context to context.

The term was first used by Gartner and popularized by analyst Howard Dresner. It describes the process of turning data into information and then into knowledge. The intelligence is claimed to be more useful to the user as it passes through each step. BI describes a set of concepts and methods to improve business decision making by using fact-

based support systems. Gartners's definition of business intelligence includes all the ways an enterprise can explore, access and analyze information in the data warehouse to develop insights that lead to improved, informed decisions. BI tools include ad hoc query, report writing, decision support systems, executive information systems (Key Performance Indicators) and techniques such as statistical analysis and online analytical processing (OLAP).

One of most complete definitions of the business intelligence can be found on the IBM' web-site:

"Business intelligence is the gathering, managing, analyzing and sharing of information in order to gain insights that can be used to make better decisions. Business intelligence turns information into intelligence, intelligence into knowledge, and knowledge into business wisdom. Combining advanced techniques such as data warehousing, data mining, and decision support, business intelligence systems offer the ability to transform information into powerful customer relationship management systems that can help create stronger, more profitable relationships, identify new business opportunities – even anticipate customer demands."

Business Intelligence (BI) can be seen as an umbrella that covers a whole range of concepts. BI can be approached roughly as being a Data Warehouse, with three layers on top of it: Queries & Reports, OnLine Analytical Processing and Data Mining (see the pyramid below). Authors and companies adopt this ordering widely. However, other orderings exist as well, with the result that some contradict each other. That is simply because the boundaries between the different components are very vague.
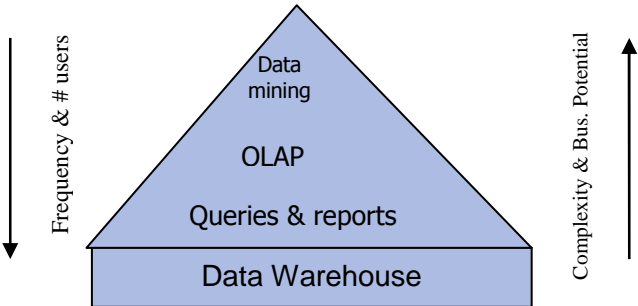

Figure 1: Components of business intelligence

The above ordering of components hanging under the umbrella of Business Intelligence is widely adopted. However, it must be said that there are authors who do not adopt these four components, or who name only some of them and add other components. Simon & Shaffer [7], for instance, include Executive information systems (EISs) as an easy-to-use 'extension' of OLAP. But then again, Turban & Aronson [8] state that the term Business Intelligence is used to describe the new role of EIS. In other words, they mean it as a replacement.

There are also different views that describe BI as successor of DSS. For example Jonathan Wu in the article Business Intelligence: What is Business Intelligence? [9] says: "The next generation of DSS applications evolved into business intelligence systems. These applications provide users with the ability to easily extract data from one or more different sources and subject matters. Formatting the data for a report or graphical representation is also easier. In addition, BI applications provide users with the capability of multidimensional analysis. For example, users can drill down on an income statement moving from net sales to sales by product to sales by product/region and, finally, to sales by product/region/customer. This capability provides users with the ability to answer questions such as: What was the sales mix

of products sold? Which geographic regions did we sell the most and the least products? Who are our top customers by geographic region and by product?"

Against Wu description, D. J. Power covers BI applications into group of data driven DSS and to make it more complicated, there are BI solution providers involving text mining, web mining and statistical models into their applications.

3. Conclusion

So what is the main difference between BI and DSS? Above stated description explain problems that appear in connection with selection of appropriate decision support technology. Managers are given many confusing and sometimes contradictory information about possible tools. Whilst scientific community operates with term decision support systems to explain tools for decision making, software producers use term business intelligence for similar functionality.

To make it much clearer we introduce pictorial summary of BI and DSS components on the Figure 2.
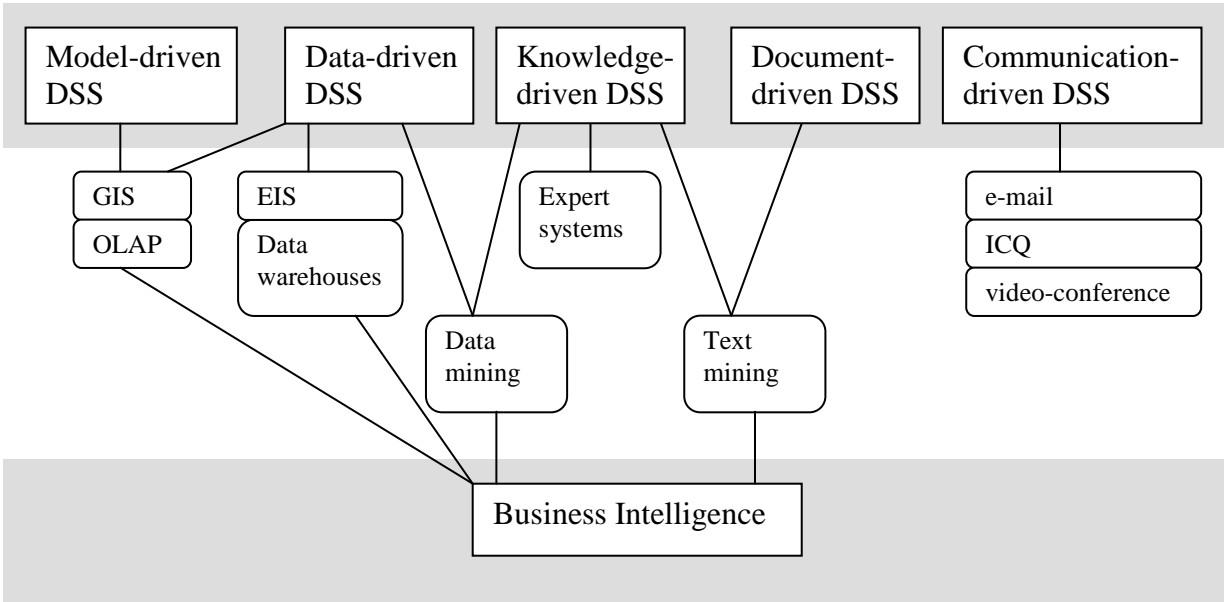

Figure 2: Components of BI and DSS

Figure 2 clearly explain content similarity between BI and DSS. Nevertheless structure of BI is not stable; producers of business intelligence solutions may cover only some components into their products or expand utility function according to customer wish. We can conclude now that the branch of BI is developing and future components can be absolutely different.

4. References

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