

THE INTELLIGENT BUSINESS INTELLIGENCE SOLUTIONS

ADRIAN COJOCARIU, CRISTINA OFELIA STANCIU

”TIBISCUS” UNIVERSITY OF TIMIȘOARA, FACULTY OF ECONOMIC SCIENCE, DALIEI STR,
1/A, TIMIȘOARA, 300558, ROMANIA
ofelia.stanciu@gmail.com, a_cojocariu@yahoo.com

Abstract:

Business Intelligence solutions have become a must for a company that aims to be successful. Accessing the data that is stored in various forms within the company’s departments is very difficult and combining all that data is even more difficult. Business Intelligence solutions are the answer for managers to support them for an efficient data analyzing process. A Business Intelligence solutions facilitates predictive analysis using data from various sources and generates valuable information for the users involved in the decision making process.

Key words: business decisions, intelligence, data warehouse, data mining

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INTRODUCTION

Nowadays organizations are confronting a great challenge in dealing with the huge amount of data that is gathered. Their goal is to be able to use the data in order to be able to make the most effective decisions for the business and Business Intelligence solutions seem to respond well enough to these needs.

Business Intelligence (BI) can be considered on two perspectives, related to the “intelligence” term. The first one refers to the human intelligence capacity applied in business, while the second one refers to intelligence as valued information for its spread and relevance, as expert information, knowledge and efficient technologies in organizational and individual business management. In this last context, business intelligence is a large collection of applications and technologies for gathering, accessing and analyzing data in order to help users to take efficient decisions. All the factors that might affect the business must be known, factors such as clients, competitors, business partners, economic environment and internal operations.

A subdomain of BI, known as *competitive intelligence*, is exclusively focused on analyzing the external competition environment. Information is collected considering the competitors actions and decisions can be made based upon this information.

BUSINESS INTELLIGENCE IN ORGANIZATIONS

BI is a means for organizations for making well-informed business decisions and thus it can constitute the source of advantages in the competition. This can be applied especially in the situation where information can be extrapolated from external economical parameters and where precise forecasts of the future tendencies or economical conditions can be obtained.

The ultimate goal of BI is that of improving the timing and quality of information. A piece of quality information that comes quickly can be compared to a magic sphere that indicates the right path to take. BI determines:

- the position of the company on the market, compared to the position of competitors;
- changes in customers' behavior;
- the capabilities of the company;
- the market conditions, future tendencies, demographical and economical information;
- the social, legal and political environment;
- moves of other companies on the market.

The companies realize that in the fast-moving and ever-changing competition environment, the only means that will lead to acquiring the advantage before the competitors do is related to the time taken to respond and to adapt to changes. BI allows the companies to use the collected information in order to be able to adjust themselves in a timely fashion when changes occur.

BI offers multiple benefits to the companies that make use of it. BI can dispose of a considerably large amount of assumptions taken in the premises of a company, can improve communication levels between departments when coordinating activities, and permits the companies to rapidly respond to financial-related changes, customer requests and supply cycles. BI improves the global performances of the company that uses it.

Information is known to be one of the most important resources a company detains, seconded only by its human resources. So whenever a company makes a decision based on correct and prompt information, the performances of that company are improved. BI also speeds up the decision making process because companies realize that information can be used for obtaining an advantage against their competitors, thus, when a company gains access to key-information it immediately makes use of it before its competitors do. Also, BI maximizes the customers' satisfaction, providing the company with the ability of taking good care of its customers' requests and needs.

Among the factors that control BI, we can mention the customers, the competitors, the business partners, the economic environment and internal operations. Customers represent the most critical aspect in a company's success. Without them a company cannot exist. So it is very important for a company to possess information regarding the likes and dislikes of its customers. A company should quickly adapt to the customers' ever-changing requests. BI provides a company with the ability of collecting information regarding the market tendencies and of creating new products or services in anticipation of the customers' needs.

The competitors can be a huge obstacle in the way to success of a company. Their objectives are the same, to maximize the profit and satisfy the customers. In order to win, a company must always place itself one step ahead of its competitors. BI can provide the company with the steps its competitors make, in order to be able to make better-informed decisions.

The business partners must possess the same strategic information as the associated company in order to avoid misunderstandings that can lead to inefficiencies of the whole. By using BI, a company and its business partners can share this kind of information.

The economical environment as well as the economical status and other key factors are very important items to consider when making business decisions. BI provides information regarding the economical status so as the company can make considerate decisions regarding the timing of a new possible expansion or redrawing of business operations.

Internal operations represent the daily activities that take place within a company. A company requires very solid knowledge of these internal activities from top to bottom in order for it to function correctly. A random decision, taken without

knowing the functionality of the entire organization, might have a negative impact upon the business. BI offers complete information regarding the organization within a company.

BI offers organizational data in such a manner that the filters of organizational knowledge can be easily associated with these data and transformed into information that benefits to the company. The staff involved in the BI processes can use software applications and other technologies in order to collect, store, analyze and obtain data access, and for presenting these data in a simple and organized manner. Software applications help to better manage the business performance and tend to assist people in making better business decisions by providing them with correct, updated and relevant information when necessary. Some companies use data warehouses because these represent a logical collection of information gathered from different operational databases in order to create BI.

BUSINESS INTELLIGENCE SOLUTIONS

The people involved in working with BI have developed tools that ease this work, especially in the situations when the tasks imply collecting and analyzing large quantities of unstructured data. Usually each supplier has its own way of defining BI and thus produces tools that perform BI in the manner it is needed for that particular case.

The development directions of BI are influenced by marked evolution and organization evolution; these directions are pointed out within the following, indicating segments on which some pressing must be made.

Performance Management – has the role to provide information to the individuals that are responsible of certain activities. The whole decision process is formed by combining the business process, transaction systems, data warehousing, BI and Business Performance Management. The Business Performance Management aims to define the strategic goals, to improve strategy, plans and execution of plans, in order for the organization to reach the right direction.

Most of BI products are only processing the data obtained from another application, but there are some BI products able to integrate unstructured data. Low quality data may affect the BI solutions, leading to problems among the clients and to a limited use of BI. It is recommended to integrate some capabilities to measure and validate data, in order to solve the BI issues related to data verification. Afterwards, there may be needed data correction stages, to increase the trust level of the BI solution. Advanced users of BI technologies need predictive analysis to be able to build possible scenarios of different future actions. Prediction analytics are lately often included in the applications instead of being purchased as individual Data Mining solutions.

BI systems have evolved in three stages [Figure 1].

Initially there were SQL and client/server applications were used to produce a huge amount of paper reports, very difficult to analyze, or were used only by specialists in analytics. The second generation has been based upon data warehouse that stores current and historical data, much better organized than traditional data bases. The last and very much improved generation of BI is represented by data mining technologies and statistical methods.

At any level of an enterprise one has to deal with very large amount of data, provided by internal and external sources of the company. Internal sources are represented mainly by the manufacturing system of the company, while external data sources are represented by partners, clients, environment, market etc. The amount of data provided by internal sources is superior regarding to the amount of data provided

by external sources, but the latter is increasing due to the development of some advanced techniques of data collecting.

The large amount of data of an organization must be safely stored, in order to be explored, and the main storing means are the data warehouse and data mart.

The data warehouse is a complex system that contains the operational and historical data of an organization, being separate from the other operational data bases. The enormous amount contained by a data warehouse comes from internal and external sources. The data warehouse overtakes the data from operational data bases, data on which different analysis will be made in order to support the decision maker within the decision process.

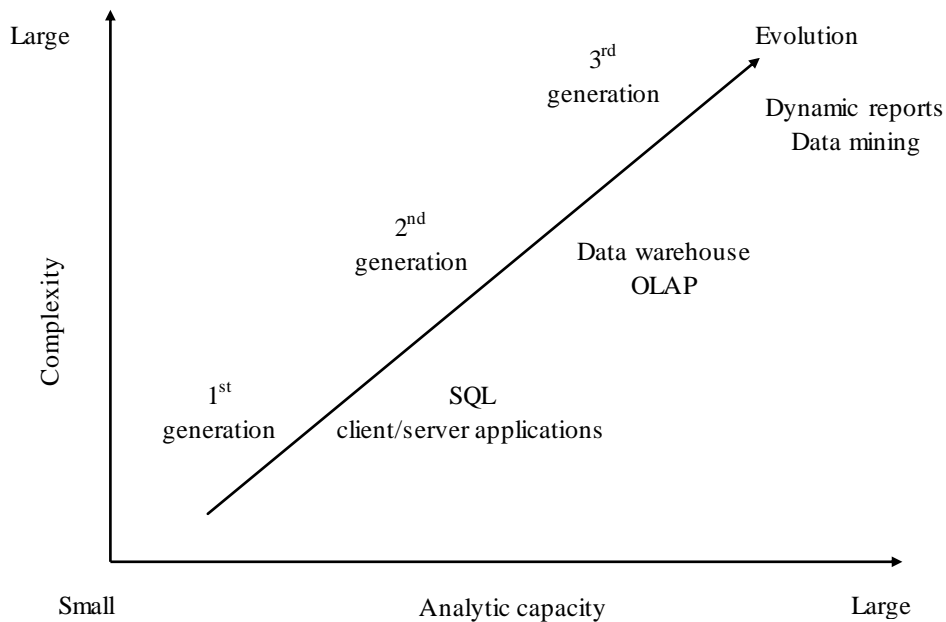


Figure 1. The evolution of BI systems
(Source [12])

Data warehouses contain different types of data: detailed data, summary data, metadata. The detailed data contains data that refers to recent events, and due to the large amount they require strong computers to manage and process them. The data warehouse should only contain data that is useful and necessary for different analysis areas. The summary data are used more often and are already an analysis and synthesis result of information required by decision systems. Metadata, as a term, can be translated by “data about data” [6], representing a solution for grouping information regarding the data warehouse and the associated processes. There should be no confusion between metadata from the operational environments and the metadata from the data warehouses. While the metadata from the operational systems are almost as important as documentation, the metadata from the data warehouse have a more important role as documentation. The metadata from the two environments are used by different types of subjects, as shown in Figure 1. The metadata from the operational systems serve the IT experts, while the metadata from the data warehouses serve the analysts involved in decision support systems, as they require complete information regarding the way of using the data warehouse, information provided by the metadata.

Another entity similar to the data warehouse is the data mart, which has lead to quarrels between scientists, whether they mean the same thing as data warehouses or not. The data mart is not equivalent to the data warehouse; it is a collection of data by

areas of interest, according to the needs of a certain department of the organization. There is a data mart for the financial part, a data mart for the marketing part etc., these data marts being almost totally independent on each other.

Data types are of two different kinds: dependent and independent. A dependent data mart is the one that uses the data warehouse as a source, and the independent data mart is the one that uses its own applications as sources.

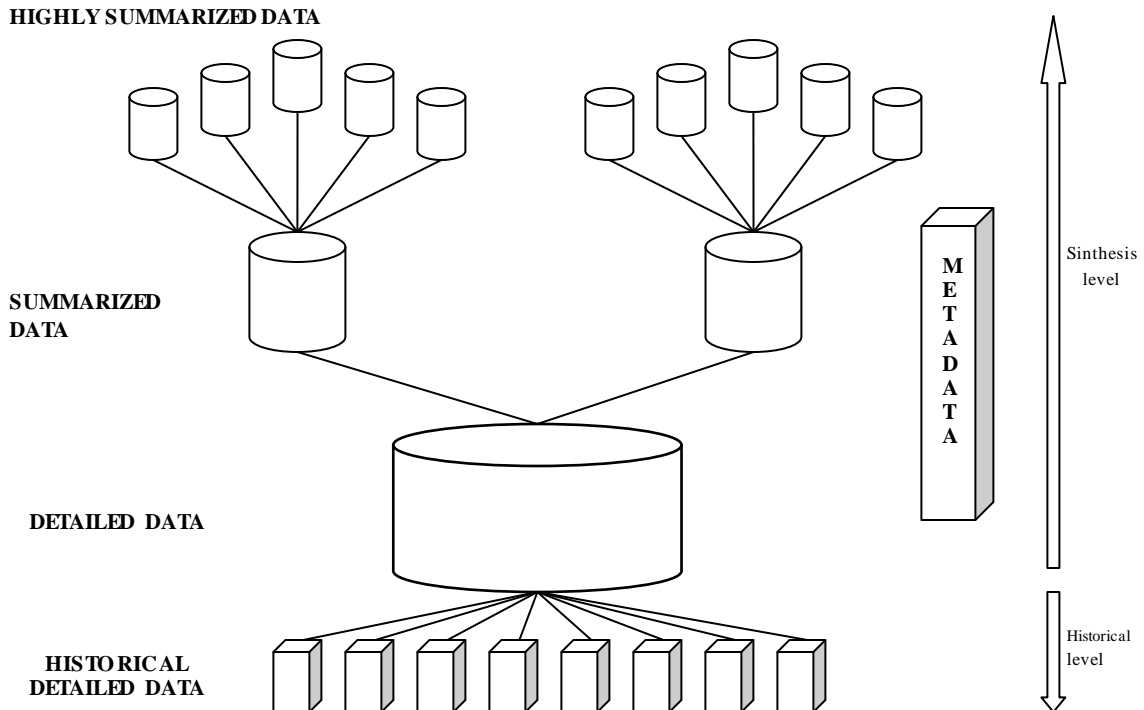


Figure 2. The detail levels of data within data warehouse
(Source: [6])

Data warehouses can be very useful to various categories of deciders, and the most important ways to benefit from the data within the warehouses are online analytical processing (OLAP) and Data Mining techniques. The OLAP technology refers to the possibility of aggregation of data in a warehouse, being able to filter the large amount of data to obtain useful information for the decisional process within an organization. According to specialists, an alternative term for describing the OLAP concept would be FASMI (Fast Analysis of Shared Multidimensional Information). The essence of each OLAP is the OLAP cube, also known as the multidimensional cube composed from numeric facts called measurements, categorized by dimensions [3]. These measurements are obtained from records in the relational databases tables. The outcomes of user requirements can be achieved by dynamically traversing the dimensions of the data cube, on a high or detailed level.

Data Mining technologies, due to their characteristics, are very suitable to analyze large amount of data. Data Mining is aiming to discover patterns within data sets, while other analytical technologies, such as queries, statistical analysis systems are not able to, and OLAP tools are based upon verifications, which prove to be limited.

The collecting of data that reflects an organization's activity has become vital in order to achieve competitive advantage. The medium and large companies have made investments into computer based systems that collect data and are able to manage very large data bases. The main task these systems have to successfully fulfill is knowledge discovery that follows after the reasoning upon the information that results from the collected data.

Data Mining technologies can accomplish the following tasks:

- prediction – future values of variables we care about can be acquired by finding patterns in examples and developing a model;
- classification – finding a function that classifies the records into discreet classes;
- relation detection – allows searching for the most influent independent variables;
- explicit modeling – describing different variable dependencies through explicit formulas;
- clustering – allows identifying similar record groups that are different from other records not in the group. It is often needed to also identify the variables that lead to obtaining the best clusters.

Patterns established by Data Mining technologies that are generated using prediction techniques prove themselves to be highly important throughout the decision-making process because they bring to light various aspects that can lead to an improvement of the decision-making process, from an efficiency point of view as well as from a time-consuming one.

The large amount of data is outrunning the human processing capacity, also in order the decisions to be correctly grounded, systems that are using Machine Learning technologies are required. These systems allow the discovery of patterns at the very level of unprocessed data, providing different results that can be used within the decision support systems but can also be used by the human analyst.

The Data Mining process consists in four important phases: data collecting, data preparation, pattern discovery and pattern analysis. Data collecting phase involves overtaking data from different sources, and considering that this data could be heterogeneous, the preparation phase will normalize the data and represent it in structures, in order to facilitate the data use. The data identified after certain characteristics during the previous phase is extracted and afterwards formatted, so the data will be represented in the form that the Data Mining application requires. The discovery of new patterns follows from applying Data Mining technologies upon the selected data.

Nowadays, computer based information systems that are using Data Mining technologies are able “to learn” from the previous behavior of the considered elements, and based on the knowledge following from the “learning process” they are able to make hypothesis which they will be testing. The knowledge that proves to be valid and useful can be integrated within the decision support systems, in order to be useful to the decision makers and assist them in making the right decision.

CONCLUSIONS

Business Intelligence has brought a lot of changes to decision making process and to the decision support systems. Decision support systems have to analyze and process the data, resulting this way information, and then knowledge. Operational and historical data of an organization are usually kept in data warehouses. Data warehouse is taking data from the operational data base, and different analysis for the decision process will be made upon the data from the data warehouse. The main techniques to benefit of the data from data warehouses are the on-line analytical processing solutions and the Data Mining techniques. The Data Mining techniques have evolved, at the present time being able even to “learn” from previous behavior of the considered elements, and based upon the knowledge acquired during the learning process will form hypothesis and test them.

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