KEMI-TORNIO UNIVERSITY OF APPLIED SCIENCES

Business Intelligence: Managerial Relevance, Software Solutions and Development Trends

Andra Gogu

Bachelor's Thesis of Degree Program in Business Information Technology

Bachelor of Business Administration

TORNIO 2012

ABSTRACT

Andra, Gogu. 2012. Business Intelligence: Managerial Relevance, Software Solutions and Development Trends. Bachelor's Thesis. Kemi-Tornio University of Applied Sciences. Business and Culture. Pages 72.

Information Technology represents a wide dimension with many types of data from which the information can be obtained. Without a complex system that is able to analyze the different types of data and return the obtained result to the user, the information will no longer have value. The concept of Business Intelligence analyzes and converts data into information in order to improve the decision making process.

The objectives of the research are to analyze the BI concept and the technologies used to enable its applications within the strategic management. In addition, the research studies the software solutions and strategic goals of BI and how its influences on the management of an organization. The research explains the benefits of this concept and development trends.

The research explores the capabilities of BI related with IT tools, by categorizing these instruments depending on the field that covers. Based on the research area and questions, exploratory research was chosen. This methodology is appropriate because the work includes reviewing literature and analyzing the data in order to define the subjects that the topic includes and draws a clear conclusion about the BI use today. This selected method is used principally to advance understanding of the BI topic to the category of people that are interested in this new trend.

The outputs of this research are ideas regarding the use of BI information and communication technologies within the strategic management and an comparative analysis between BI software solutions. In addition, the research provides information about the development trends in the area of BI.

Keywords: Business Intelligence, Information Technology, Data, Information

CONTENTS

ABSTRACT

FIGURES

FIGURES

1 INTRODUCTION

1.1 Motivation and Background

Decisions are a part of the daily tasks of any enterprise and can involve a certain percentage of risk. Therefore, decision makers should be able to access a wide range of information systems in order to gain knowledge necessary to take inspired decisions. In order to acquire knowledge, they must be able to access the right information. Business Intelligence (BI) has the capability to support the individuals in every step of the decision making process. For this reason, many organizations implement BI systems. (Howson 2008, 2-5.)

BI represents a complex concept and therefore there are many definitions that intend to advance understanding of the role that it has within the organization. The issue is that many of the definitions cover only some of the aspects of the BI concept. Definitions of the concept BI are introduced. According to Thierauf (2001, 1)**,** "BI systems move decision makers to the next level by providing them with a better understanding of a company's operations so that they can outmaneuver competition". It is also sustained that, "through business intelligence applications such as target marketing, customer profiling, and product or service usage, analysis, businesses can finally begin using customer information as a competitive asset". Sabherwal and Becerra Fernandez (2008, 6) describe BI as "providing decision makers with valuable information and knowledge by leveraging a variety of sources of data as well as structured and unstructured information". Therefore the definitions discussed above have the role to present the evolution of the BI concept over the years and to analyze its benefits within the organization.

Summarizing the definitions, BI represents an important system that supports the decisions making process through a variety of applications. Through these applications, BI has the functionality to help organizations gain competitive advantage, understand their customers, raise performance, increase the level of knowledge and provide quality services. This thesis work analyzes the role of BI applications in the strategic management and discusses BI development trends.

Organizations acquire large amounts of data. This data needs to be stored in a format which can be accessed by all the entitled members of the organization any time is necessary. The software solutions of BI systems facilitate information integration which is the capability that combines structured with unstructured data. Other BI capabilities are insight creation through which organizations acquire knowledge necessary in the decision making process and organizational memory that has the attributes to extract, process, consolidate and transform data in information. These solutions lead to improved organizational performance. The relationship between BI and IT is critical today since BI applications are based on software solutions. BI acquires knowledge from the explicit organizational memory from an enterprise in order to create value. (Sabherwal & Becerra 2011, 8-55.) Therefore, the aim of BI is not to teach the managers how to take decisions, but helps managers to give a verdict based on the facts and figures from the organization and not on assumptions.

Prescott and Miller (2001, 33) point out that BI provides many opportunities for the companies because it generates knowledge from data that enterprises accumulate over time. In the business environment, knowledge is the most important aspect that influences the performance of any organization. Enterprises which make decisions based on the knowledge about the status of the organization can predict customers' needs, overcome the competition, set future objectives or plan internal business processes. BI has the scope to analyze data and convert them into information that all the members of an organization can understand and gain knowledge. According to Ericsson (2004, 4) in 1994 the BI market measured at about $500 million, in 2002 the revenues were measured at $ 3.3 billion. This shows that the use of BI applications has increasingly grown in the last years. Many of the organizations became dependable on the benefits that BI provides. A big growth in the market indicates that BI became a trend at the level of organizations and its solutions cover the business requirements.

The facts that BI solutions are increasingly used within organizations and that in the last years BI market registered such revenues, determined the research topic of this thesis. This research is focused on the concept of BI related to the business environment. The topic is relevant because in the last years, according to BusinessIntelligence (2012) BI "continues to show up on CIOs´ priority list". The thesis is focused on this topic because many of the top vendors that have been active in the IT field for more than thirty years, such as SAP, SAS, Microstrategy, Oracle, IBM invest in BI applications.

Moreover, drawing from the definitions suggests previously in this text, BI is a promising system that enhances many capabilities through the requirements within the business environment.

1.2 Objectives

The objectives of this thesis are to study BI information and communication technologies that can be integrated in the business environment. As briefly discussed in the background, BI is a solution that most of the organizations adopt today. Therefore, the objective of the research provides perspectives intended to enhance BI capabilities and technologies. Moreover, since BI has been increasingly used in the last years, the research will provide an overview about the technological development trends in the area of BI. In addition the research provides an comparative analysis of BI software solutions as an reference for the organizations which want to invest in BI solutions. To achieve these objectives, the research analyzes the use of BI in the strategic management in order to identify the most important capabilities, which will be used to classify the technologies included in BI system.

1.3 Thesis Structure

 Chapter 1 is the introduction of this work and consists of a general discussion about the research topic which is motivated and the objectives of the thesis are defined. Chapter 2 outlines the research questions on which the work focuses and describes the methodology through which answers to these questions are sought. Chapter 3 as part of the strategic management" analyzes the role of BI within an organization, and the factors that influence BI demands within the business environment. Chapter 4 covers BI capabilities and provides an analysis and classification of them in order to make a connection with the next chapter. Chapter 5 and Chapter 6 present the specific technologies that enable different BI capabilities. Chapter 7 depicts the most successful BI applications from today and examines their role in the business applications. Chapter

8 compares BI software solutions. Chapter 9 studies BI development trends and their use in other fields not necessarily lifted to the strategic management level. Chapter 10 discusses the results of this thesis, limitation of the work and offers directions for future research.

2 RESEARCH QUESTIONS AND METHODOLOGY

2.1 Scope of the work

The research topic is focused on the BI concept. The objective of this research is to analyze BI applications and technologies that are used in the business environment and to identify their advantages and capabilities. Based on this analysis, this thesis defines the technological development trends in the BI area. To accomplish these objectives, the thesis includes an analysis and classifications of the BI concept. The main output of the research is intended to present effective uses of BI within the business environment along with the technologies and applications that this system includes.

This chapter includes the research questions and methodology of this thesis.

2.2 Research Questions

Deriving from the objectives of this thesis work, answers to the following research questions are sought in this work:

RQ 1 What is the role of Business Intelligence applications in the strategic management of an organization?

BI represents an important support in the strategic management level of an organization which includes a wide category of tasks that enables enterprises to achieve competitive advantage from complex structures of data (Parr 2009, 65). It is necessary to understand the role that BI has from the managerial perspective to point out the scope of its applications. The work focuses on identifying BI as a part of strategic management. The research explores the strategic goals of BI. Based on that, the factors which increase the preeminence of BI in the strategic management are determined.

RQ 2 Which information and communication technologies are used in BI applications?

BI applications include different types of technologies depending on the specialization for which they were designed. Today, the technology that is used in the business environment influences the efficiency with which the enterprises operate. (Sabherwal & Becerra Fernandez 2011, 51-100.) In order to define the technologies that BI uses it is necessary to describe the capabilities which are associated with BI applications. The description helps to detect the technologies which enable BI capabilities. The research provides a classification of the technologies, the scope, usability and resources that they use. In addition, are analyzed the BI applications developed by the mega-vendors within the IT field and compare them in order to help organizations to decide which is suitable for their business.

RQ 3 What is the conceptual use and technological development trends in the area of Business intelligence?

IT represents one of the industries that never stops growing. The future of BI focuses on making this technology relevant for anyone. (Howson 2008, 199.) The research analyzes the technological development trends of BI. The study analyzed BI future perspectives and the factors that influence the new development.

2.3 Research Methodology

The research method used in this work is exploratory research based on the literature analysis. The selected method is used principally to advance understanding of BI to the category of people that are interested in this concept. The subject area of the thesis provides information regarding the concept of BI, the importance of this system within the organization, technologies used, strategic goals, structure and the direction in which is orienting in future.

The output of this topic is mainly theoretical, intended to study BI applications and technologies used within the organization. It performs a comparative analysis of BI software solutions which offers relevant information for the organizations which are

interested to achieve BI system but are not decided on which applications to invest. In addition, the topic covers aspects related to the methods in which BI improves the daily tasks within the business environment, the advantages that it brings and what are the BI future development trends.

According to Panneerselvam (2004, 6), exploratory research "is an initial research which analyzes the data and explores the possibility of obtaining as many relationships as possible between different variable without knowing their end-applications. This means that a general study will be conducted without having any specific end-objective except to establish as many relationships as possible between the variables of the study. This research provides a basis for general findings. Researchers and practitioners can explore the possibility of using such general findings in future. This type of research lays the foundation for the formulation of different hypotheses of research problems."

Exploratory research is an approach selected for this thesis .This work analyzes the BI concept and explores the technologies which determine its efficiency in the business environment. The research is based on literature review. It acquires relevant data proper for the topic and ensures that the information used is up to date and valid.

Due to the fact that the research work does not need to go into the field to obtain the needed information, all the data for writing the thesis is gained by performing deskwork activities. The reviewed literature includes materials from the Library of Kemi-Tornio University of Applied Sciences (KTUAS), KTUAS electronic library, Ebrary electronic library, and diverse articles from the Internet. Qualitative data is collected for this thesis because the topic of this work includes discussions of the different concepts, methods, applications and technologies that BI is comprised of.

3 BUSINESS INTELLIGENCE AS A PART OF STRATEGIC MANAGEMENT

This chapter defines the role of BI in the business environment. In addition, the chapter includes an analysis of the strategic goals and factors that increase the prominence of BI in the strategic management. The aim of this chapter is also to explore the advantages that BI systems provide when implemented within an organization.

BI represents an important system applied in the enterprises today. In the last years, the number of organizations which rely on BI systems has increased due to the fact that a number of the IT software solutions became cheaper and reached high performances. (Thierauf 2001, 6.) Therefore, organizations implement BI systems because they demand for high technology software with reduced costs and abilities to solve the problems within the enterprise. This information is intended to link BI request on the market with IT development and costs. The question now is what if the IT software solutions will no longer provide some of the applications at a reduced cost than the success of BI will be affected. According to Howson (2008, 10), "there is one crucial aspect of extending the reach of business intelligence that has nothing to do with technology and is Relevance. Understanding what information someone needs to do a job or to complete a task is what makes business intelligence relevant to that person." Therefore, to answer the above question, the secret of BI success does not depend on the technology that it uses or the costs but on the role that it has in the strategic management. According to Pareek (2007, 7) organizations implement BI systems because of its capabilities to understand and anticipate the needs of customers, contractors, competitors, business partners and helps in the decision making process. Consequently enterprises achieve BI because of its capacity to accomplish users' requirements (Pareek 2007, 7). Through the aspects discussed above, such as increased performance, reduced costs, important role in the decision making process, it is pertinent to say that BI has an important role in the strategic management of an organization.

Any business industry needs to make informed decisions. Along with IT development, BI technologies have gained the capability to automate many tasks within the business environment. BI enables functionalities such as to predict and forecast, collect and

analyze a multitude of sources to gain competitive advantage, exploit emerging opportunities, and reduce costs by streamlining processes (IBM Reedbooks 2002, 2). Therefore BI capabilities can be applied in any business that aims to make effective decisions, plan future objectives, understand customers' needs or minimize the costs and maximize performances.

At the strategic management level, BI represents a crucial element. The capabilities that BI provides are related to fields such as Business Performance Management, Business Process Management, Corporate Performance Management and Business Activity Monitoring which support BI to increase its efficiency and strategies within the organization (Sabherwal & Becerra 2011, 42).

Business Performance Management incorporates BI technologies, practices and software. Through Business Performance Management, BI has the role to support the strategic planning, offering dashboards through which managers can monitor the progress of the organization linked with the business goals and indentify methods to improve long term business performance. BI improves business execution providing tools to monitor the workflow and to report functional performance. (IBM Redbooks 2005, 29-30.) Through these observations it is relevant to add that Business Performance Management supports BI to assist organizations in the business planning and execution.

Business Process Management enables BI to help organizations the possibility to gain insight by providing a real-time basis that enables enterprises to share knowledge in a secure environment. This method insures that organizations reach their objective and encourages the collaboration between them. (Walker 2005, 33-34.) Therefore, this capability is beneficial for organizations that do business together, providing the necessary environment where they can communicate, share data and set future plans.

Corporate Performance Management is the field of BI that enables processes such as strategic planning, performance improvement, develop of strategic plans (Paladino 2010, 54). Through these capabilities employees can monitor performance in order to understand what the status of the enterprise is or what needs to be improved, and based on these factors, to set strategic plans to raise the performance of the organization. The

aim of Corporate Performance Management is to help managers set the objectives of the organization and implement the plan though which the objectives are accomplished.

Business Activity Monitoring is an extension of BI that provides real-time business analytics which enables functionalities to monitor, report or alert (Harpal, 2005). Thus, the overall objective of Business Activity Monitoring is to help decision makers to improve the quality of the decisions within the business environment. Therefore, is evident that BI systems have a relevant role within an organization contributing at many activities which have the role to improve the business environment.

3.1 Strategic goals of Business Intelligence

Many of the organizations are data-rich but information-poor. This is a result of the lack of knowledge to manage data and of the insufficient analytical tools necessary to increase performance. BI systems represent the solution to these issues that enterprises face. Correctly applied, BI has tremendous capabilities to generate profit. (Williams S. & Williams N. 2006, 1-2.) In other words, to take inspired decisions, any business industry needs a good manager of data that can offer the right information. Thus, BI is an important system within the enterprises that aids to help companies to manage correctly data in order to generate profit and raise progress. Other than that, BI offers support to improve service quality, decision making process, business performance, management and control (Howson 2008, 1-5). Accordingly, the scope of BI is to focus on the delivered quality of services that enables organizations to reach their objectives.

For many years, the issue concerning IT specialists was to find solutions to automate business processes. They believed that finding a response to this problem leads to an enhanced way to manage organizational progress. BI represents the current solution to the concerned problem. (Herschel 2012, 29.) Therefore BI aims to automate the processes of the business environment in order to raise work efficiency and to minimize the time necessary for the daily tasks providing users more time to focus on the specific objectives of the organization. BI highlights the actual solutions of computer based

systems regarding the smart business research that are based on modern technologies to facilitate managerial decision making process.

According to Ericsson (2004, 9), BI systems "allow decision makers to understand the story behind the numbers and produce insight into the true dimension of the business". Therefore, the goal of BI is not only to help in the decision making process or to deliver better quality services, but in addition it produces a big impact in an organization. These advantages are possible because of the complex structure of BI tasks which cover most of the requirements of the business environment. Through the multitude of tasks that BI offers, another relevant goal, strategic alignment, is reached which represents a critical element of BI success (Williams S. & Williams N. 2006, 1). Strategic alignment enables organizations to increase the speed of decision-making while it eliminates the divisional structure and aligns objectives with their implementation (Sledgianowski 2005, 16). Thus, BI enables organizations to take effective decisions fast which represent another strategic goal that BI capabilities achieve. Therefore, it is important to mention that a BI system applied correctly within the business environment can reach strategic goals that can influence the progress and processes of the organization and lead to better results.

3.2 Factors Increasing the Prominence of BI in Strategic Management

As discussed in the previews subchapter, BI is an important system for organizations today, due to the goals that it has within the business environment such as to enable real time decisions, strategic alignment, automate processes, improve decision-making, convert information into knowledge, raise performance, improve service quality. These goals are in direct relation with a series of factors that determine the prominence of BI in the strategic management. As Sabherwal & Becerra Fernandez (2011, 8-10) point out, these factors can be divided in four sets represented by exploding data values, increasingly complicated decisions, need for quick reflexes, and technological progress.

The increased data volumes makes difficult for managers to effectively use the data within the enterprise in the decision making process (Sabherwal & Becerra Fernandez 2011, 8-10). BI has the capability to help business users to analyze vast amounts of data

that is collected from multiple places in order to enable enterprises to focus on organizational strategies. (Raisinghani 2004, 229). By gathering the big amounts of data and helping users to select the relevant informations, organizations are ensured that make effective use of all the historical data until the current situation of the enterprise. It is important that decisions contain all the relevant details in order to have successful results. Therefore BI solves the issues concerned with big amounts of data and represents an important approach within the organization.

According to Sabherwal & Becerra Fernandez (2011, 8-10), because of today's competitive environment, enterprises face the challenge of increasingly complicated decisions. As discussed earlier, BI has the role to archive all the data of an organization in order to help users to easily access the data when needed. BI systems include operations to collect and analyze data from internal and external databases in order to gain competitive advantage (IBM Redbooks 2002, 5). Through these operations BI succeeds to answer to the challenges that the organizations face. Even if BI has the necessary instruments to avoid the issues concerning the big amounts of data and complicated decisions, another factor that raises problems within the business environment is the need for quick reflexes. Managers must be able to make decisions fast in order to take advantage of the available opportunities (Sabherwal & Becerra Fernandez 2011, 8-10). BI systems have the capability to deliver real-time relevant information and knowledge necessary for the decision making (Thierauf 2001, 22). Therefore, BI is a necessary element which increases the value of decisions within the organizations. Through the solutions that BI offers it is pertinent to add that BI had overreached the fourth factor that is about the technological progress. Thus, BI occupies an important role in the strategic management of an organization through the solutions suitable for the processes within the business environment.

4 BUSINESS INTELLIGENCE CAPABILITIES

This chapter focuses on BI capabilities within the business environment. Four synergetic capabilities of BI and how they influence the processes within the organization are discussed. In addition, this chapter presents a structure of BI capabilities and what areas within the organization they cover.

In the 21st century, most of organizations perceive that business processes represents the key to gain competitive advantage. The capabilities of an enterprise are the core that create and maintain competitive advantage. (Sehgal 2011, 3-42.) Today, at the strategic management level, organizations consider BI as a primary need because of its capabilities to unlock critical data stored in corporate or external data sources. Through this capability, BI helps companies to set future objectives and strategies and to achieve these goals using BI within the entire enterprise. (Biere 2010, 5.) Therefore, BI represents an important system applied in the business environment because of its capabilities to help organizations to achieve their objectives and increase performance.

To understand BI capabilities, it is important to have an overview of this approach. According to Miller & Bräutigam & Gerlach (2006, 4), BI ensures "getting the right information to right people in the right time". Therefore, BI is intended to convert information into knowledge in order to help decision makers. It is relevant to know that BI is not a single product, technology or methodology. This approach comprises all the three elements in order to manipulate correctly the information within the organization and generate performance and profit. (Williams S. & Williams N. 2006, 2.) Thus, BI systems have an increased importance within the organizations and deliver the necessary information to the concerned persons in order to improve their decisions.

Companies aim to gain competitive advantage. BI capabilities are able to ensure that this aim is reached by enabling enterprises to drive revenue, manage costs and acquire profitability (Miller & Bräutigam & Gerlach 2006, 4.) Today, achieving revenue is a question of how well organizations manage their priorities and strengths in order to reach the proposed objectives (Charan 2004, 1). BI capabilities, as discussed earlier in the text, enable users to accumulate knowledge about the processes within the enterprise in order to be prepared to act when opportunities arise. This knowledge includes

information about all the aspects of the enterprise, costs, revenue and internal and external factors that once companies know how to manage can increase profitability and performance.

Depending on the areas covered on the business environment, capabilities can be divided in four major categories as suggested by Sabherwal & Becerra (2011, 26). The main capability of BI is to store information and explicit knowledge that can be easily accessed by all the users of an organization. This can be defined as organizational memory which integrates over time all the data of an enterprise. One important advantage of BI is based on its information integration capability, which combines structured and unstructured data from all the information sources. The third capability, insight creation produces insights from available information in order to facilitate decision making process. Presentation is the fourth capability that offers a friendly user interface and a multitude of functions. (Sabherwal &Becerra 2011, 26.)

The four capabilities and their roles in an organization are presented in Figure 1.
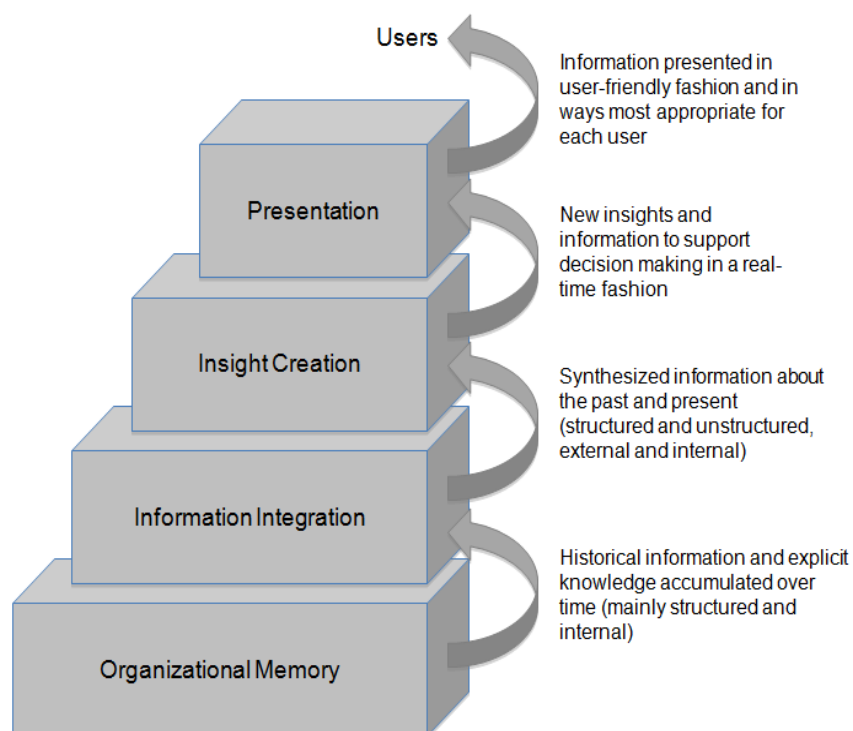
Figure 1. Synergetic Business Intelligence Capabilities (Sabherwal &Becerra 2011, 26)

The four capabilities of BI are essential to cover the needs of each field of the business industry. The capabilities sustain each other by offering the needed input, to ensure the continuity of the process. Organizational memory provides the information which was recorded over time to information integration capability. In this step all past and present information is combined including structured and unstructured data and is prepared for the third step. The insight creation capability uses the input from information integration and creates new insights based on the combined data used in the decision making process. The final step, the presentation capability, distributes the new insights that were created using a friendly interface, in a suitable manner for each user. (Sabherwal &Becerra 2011, 27.) Through these capabilities it is pertinent to say that BI has an important role in the decision making process, combining all the necessary stages that converts data into knowledge which is presented to the user in a format that is easy to understand and to draw conclusions.

Depending for the purpose of its use, BI approach has different meanings for its users. However, BI is capable to cover all the processes within the organization through a wide category of applications and technologies that converts data into information. Enterprises use this information to improve decision making process. (Pareek 2006, 9.) Figure 2 illustrates the sectors within the organization that BI capabilities cover.
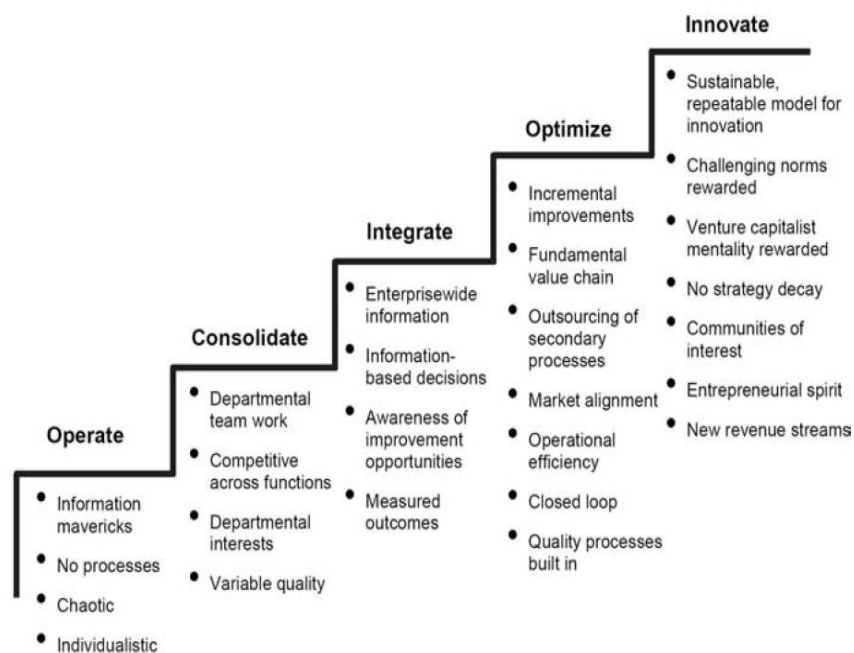
Figure 2. Structural view of BI capabilities (Pareek 2006, 9)

Figure 2 shows the aspects within the business environment that BI capabilities support. BI capabilities shown in Figure 2 advance the view about the processes where BI takes part and prove that this concept it is a necessity for the organizations. Through these capabilities employers within the organization gain insight and knowledge and improve strategic and tactical decisions (Pareek 2006, 10). Figure 2 is relevant because links BI capabilities with the concerned areas and factors which cause different issues within the organization and it offers a good understanding about the use of BI.

Other than the capabilities discussed above, BI creates an enormous business impact on its customers because helps them to make effective decisions which lead to save the organization´s budged and increase profit (Knight & Jorgensen 2010, 69). This is achieved also because BI enforces organizations to act proactive in the business environment and to obtain better results rather than wait for the opportunities to come. This represents a major capability of BI that differentiates this system to other systems available on the market. Another important aspect is that BI delivers quality and timely business information which has a major relevance for managers. (Thierauf 2001, 4-8.) This quality of BI to deliver in short time the relevant information to the right user influences the effectiveness of the decisions and the promptitude to respond to the arising opportunities. Through the capabilities provided, BI represents an important aspect in the business environment, being considered the "next logical progression in management thinking about IT" (Williams S. & Williams N. 2006, 1). Therefore, BI has a big impact in the organizations and contributes effectively to the daily tasks of the business environment. It helps to increase performance and offers real-time information to support the decision making process.

5 TECHNOLOGIES ENABLING DATA MANAGEMENT

BI platform is composed of many interrelated technologies. Each of these technologies has different functionalities within the enterprise. Multiple technologies can be combined together in order to achieve better results. (Ericsson 2004, 15.) To accomplish the objectives of the second research question, this chapter goes into details about the technologies and software tools which are used to implement BI capabilities.

5.1 Technologies Enabling Organizational Memory

Organizational memory is the intelligent element of the company (Sabherwal & Becerra, 2011, 51). The intelligence process is defined as "discovery of secret by secret means". Within the organization, intelligence represents the special type of knowledge through which enterprises observe critical threats or opportunities regarding the accomplishment of their objectives. Managed well, the processes within the organizational memory help the enterprise to accomplish its strategic or business objectives. (Waltz 2003, 2.) Therefore, in the business environment, intelligence influences the progress of the organization. Enterprises that contain systems capable to transform data in knowledge represent a major benefit through which they achieve the proposed objectives.

The technologies that BI uses ensure various applications within the organizational memory of the enterprise. These applications manage the available data and select the relevant information in order to connect it to the established objectives of the company. Organizational memory processes select the relevant information for the decision making process, pursue the role of the information in corporate knowledge and improve information accuracy and quality. (Miller & Bräutigam & Gerlach 2006, 51.) Most of the organizations choose BI systems because of its capabilities to gather data from multiple sources and make this information available to the entitled users within the organization (Moss & Atre 2003, 177). Thus, BI technologies that enable

organizational memory discover the secrets within the enterprise and draw clear conclusions which help the users in their daily tasks and decision making process.

In the multitude of technologies that BI uses to enable organizational memory, are distinguished two important capabilities, Enterprise Resource Planning systems (ERP) and Data Warehouses (DW) (Sabherwal & Becerra, 2011, 52). The work focuses on ERP and DW because represents some of the most important applications that raise the demand of BI within the organization (Pareek 2006, 105). These two types of technologies ensure that data is stored correctly and is manipulated in order to be used as future decision support and shared or reused efficiently. In 1990 organizations had to pay millions to achieve ERP systems. Enterprises show their interest in this application because data become an important source to bring immediate and durable competitive advantage. (Pareek 2006, 7.) Organizations deal with big income of data since the first business idea started, but until the firsts ERP systems were developed, the information was ignored.

ERP software connects all internal data and processes from an organization in a category of applications that share the same database. The big amount of information is stored in a data warehouse where ERP systems serve as source. ERP covers many departments as Productions, Finance, Human Resources (HR), Logistics, Sales, and other related fields. Each of these fields involve different business processes. ERP applications were developed in order to share data and processes in an efficient way to the entire enterprise while other information systems cover only one function or activity. (Sabherwal & Becerra, 2011, 52-53.) An important aspect regarding ERP applications is the ability through which ERP combines real-time data with analytical tools. Other advantages of ERP are to accelerate the business process, minimize costs, amplify selling opportunities, improve quality and customer satisfaction, and monitor results. ERP suite is made out of modules that include purchasing, payroll, inventory and other related functionalities. Installed correctly, ERP systems can reach high results for organizations such as reduce inventory by approximately 25% or deliver customer orders in 48 hours compared with the number of days that these tasks required before. (Thierauf 2001, 273.) Therefore, ERP systems have important abilities which can increase the performances within the organization and respond to users demands.

ERP systems offer many advantages within the organization which include in addition, integrated business processes over the company, single database, access to real-time transaction and many other benefits that facilitate the processes within the enterprise. These benefits influence directly and indirectly the enterprise. The direct advantages improve the methods in which information is stored and used as future decisional support, instant accessibility and fast response to user demands. The indirect advantages offer the organization monetary stability, business impact, satisfy the customers with high qualitative services and reduce the time and costs spend on different applications. (Sabherwal & Becerra, 2011, 52-53.) Therefore ERP represents an important application within the organizational memory and offers many solutions to the daily tasks of an enterprise. Through the capabilities offered enterprises make improve decisions, reduce the time allocated for different processes within the organizational memory and increase performance.

Another important application that contributes to the success of BI is DW. According to Pareek (2006, 167), data warehouses "contain data and support the tools needed to provide decision makers with insight into business operations." An important factor that influences the quality of the decisions represents the knowledge level of the enterprise. From the definition discussed above, DW is understood as a platform that contains data which is used to help users to accumulate knowledge about the operations within the organization and supports the decision making process. DW represents the BI basis and is critical for the success of an organization (Ericsson 2004, 28). The question now is why DW has such importance within the organization and what the difference between DW and a usual database is.

Information represents an important aspect within any business industry. The knowledge that an organization has, derives from the available data and the methods in which this data is organized and analyzed. Today, the enterprises that have advanced instruments to convert information into knowledge gain many benefits. Advantages such as increased performance, revenues, and efficient decisions are the result of an improved level of knowledge. DW technology delivers the exact information to the end-users helping them to gain knowledge and improve the decision making process. (IBM Redbooks 2004, 8.)

DW has an important value within the organization through the advantages that it provides. DW is a common platform which integrates data from multiple sources within the business environment. A set of characteristics differentiate DW systems from the traditional databases and have the role to improve performances within the business environment. Subject oriented role represents one of the main characteristics and contains information which offers a better view about the organization, products, inventory, that are relevant for the decision making process. Another characteristic of DW is that integrates data from different fields of the organization in a similar format. DW records the time when the different processes from an enterprise happen. This is defined as time series and provides accessibility to a full amount of data that is collected over the time. In contrast with the characteristics that On-line Analytical Processing (OLAP) systems have, where data can be inserted, deleted and updated each time is necessary, the non-volatile functionality of DW systems does not allow any changes similar to those. The data can be modified in DW systems but the time entry is registered when modifications are made. This aspect ensures that the informations do not suffer any modifications from the moment in which were stored. (Turban & Sharda & Delen, 2011, 329.)

An important aspect is that DW offers real-time information and better perspectives about the customers of the enterprise (Castellanos & Dayal & Miller 2009, 100). In today´s business environment real-time information represents an important factor that determines the progress of the organization. Enterprises that choose a system which has the ability to provide real-time information make decisions based on the current situation of the organization which helps them to take advantage of the eventual arising opportunities. Figure 3 shows DW architecture.
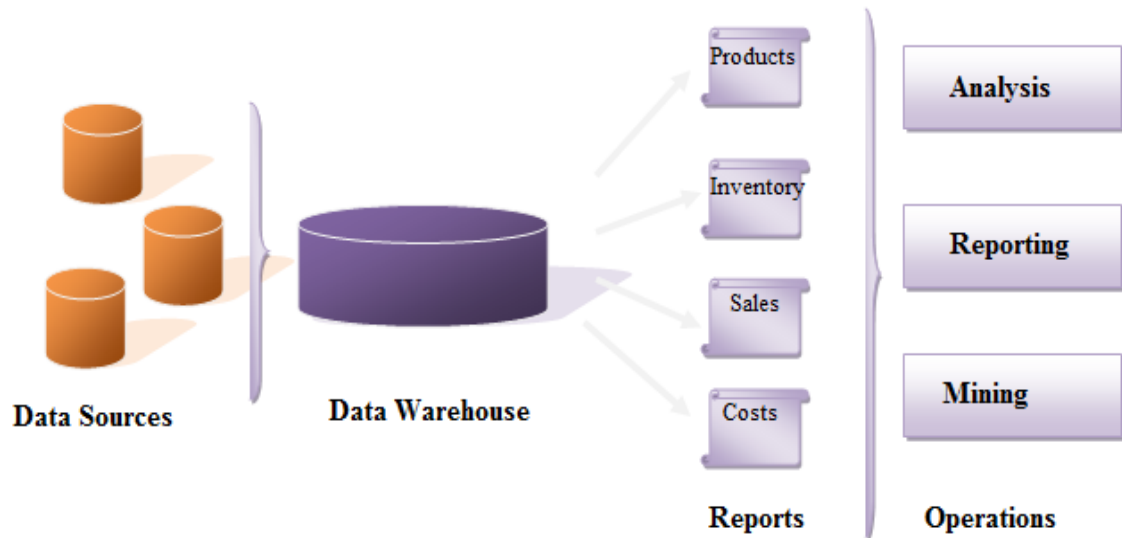
Figure 3. DW Architecture (Castellanos & Dayal & Miller 2009, 100)

As Figure 3 illustrates, DW includes all the data sources within an organization and organizes them in order to create reports. The created reports consist of information such as sales, inventory, costs, information about products, customer information. This information represents an important aspect that influences the quality of the decisions which are made within the business environment. Therefore the reports are used in different operations which advance understanding about the past and current situation within the enterprise. The data within the DW can be: (1) Subject-oriented that refers to specific information within the business environment and not at the all processes, (2) Integrated data because of the capability of DW to collect the data from all the sources of the organization, and (3) Time-variant data that corresponds to a certain period of time (IBM Redbooks 2005b, 3). Trough all these types of data, DW performs efficient reports that contain all the aspects that influence the processes within the business environment.

Three extensions of DW are Data Marts (DM), Operational Data Stores (ODS) and Enterprise Data Warehouses (EDW) (Turban & Sharda & Delen 2011, 330). DM represents a subcategory of DW that focuses on a particular set of business departments, functions, process or programs (Howson 2008, 30). According to its functionalities, DM is either dependent or independent. Dependent DM represents a subcategory of DW. It has the advantage to access big data sources and provides qualitative data that keeps a

common format accessible for all DW users. Independent DM is a limited size warehouse, which does not connect to EDW source and has the capability to focus only on a specific unit of the enterprise. (Turban & Sharda & Delen, 2011, 330.) Therefore, even if DW are divided in two categories, both of them can be used within the organization in order to achieve data which can be accessed by the entitled users whenever is needed.

ODS represents a database which stores data from all the sources of the enterprise in order to find relevant information necessary for the decision making process. ODS has the capability to integrate real-time information. Despite this quality, ODS is not capable to archive historical data which represents an important aspect when making decisions. Enterprises use temporarily the information from ODS for short time decisions. ODS consolidates the data from the organization and transfers the output to the DW in order to be reported. (Turban & Sharda & Delen, 2011, 330.) Thus, ODS represents an optimal selection for users who make short time decisions which does not involve the use of historical information.

First generation BI used EDW system implementations. EDW represents a high dimensions DW which has the role to help the decision making process. Once organizations implement EDW, DM is defined to meet the business requirements. (Pareek 2006, 152.) The applications that EDW includes use the information collected from all the fields of the enterprise. EDW saves this data into a common format for effective BI. "EDW are used to provide data for many types of DSS, including CRM, Supply-Chain Management (SCM), Business Performance (BPM), Business Activity Monitoring (BAM), Product Lifecycle Management (PLM), Revenue Management, and sometimes   even Knowledge Management Systems (KMS)". (Turban & Sharda & Delen, 2011, 331.) Therefore EDW has an increased performance within the enterprise through its capability to manage correctly the data in order to raise the efficiency of the organization.

Through the technologies discussed above, BI facilitates many tasks within the organizational memory. Enterprises that chose to implement these technologies gain knowledge and understand better what the aim of the company is. Knowledge is the key element that helps in the decision making process within the organization. Through better decisions, organizations raise performance and achieve their objectives. Therefore

the technologies enabling organizational memory are an important aspect within the enterprise.

5.2 Technologies Enabling Information Integration

Insight creation refers to the process to combine structured with unstructured data in order to gain new insights. The methods in which organizations achieve new insights are different and depend on the type of information they use as primary sources. Some of the enterprises need internal information in order to gain knowledge while other organizations rely on external information. (Sabherwal & Becerra, 2011, 81-82.) BI is a critical tool in the process of developing new insights because of its capacity to align the strategic goals of the enterprise and enlarge their productivity. Because of these two different types to acquire new insights BI has developed a wide category of applications that are suitable for each of the preferences of the enterprises (Williams S. & Williams N. 2006, 217). Therefore BI applications are in concordance with the requirements and expectations of the enterprises and ensure that they achieve new insights which help them in the decision making process and future planning.

Due to the objectives of this work, only the most important applications from each category of technologies are discussed. Therefore, in this chapter the relevant applications are analyzed which enable information integration, respectively environmental scanning, Text mining and Web mining.

Is important for an organization to have a clear view about the external changes that influence the future of the business and the decision making process. To prevent these issues, BI provides Environmental scanning process. According to Sabherwal and Becerra-Fernandez, (2011, 85), environmental scanning represents the search for external information in order to gain knowledge which helps the managers in their future actions regarding the business planning. The main functionality of environmental scanning is that it offers organizations advanced understanding about the changes within the business environment and how these modifications can affect the future of the enterprise. Environmental scanning predicts the changes that are estimated to happen in

rapport with the current situation of the enterprise. Through these capabilities, Environmental scanning raises the performances of the organization. Combined with a good decisional support, Environmental scanning tools can result as a success for organizational strategic management. (Sabherwal & Becerra-Fernandez 2011, 85.)

Text mining represents an advanced analytical application which includes sophisticated technologies that select the relevant data and knowledge from unstructured data such as text files (Miller & Bräutigam & Gerlach 2006, 157). The importance of text mining is usually remarked in fields that involve big amounts of data such as medicine, journalism and many other areas were information extraction is an important process. Text mining not only exerts a big impact in the fields discussed earlier, but in addition has an important role in the electronic communication and messages through web by setting different targets of priority. (Sabherwal & Becerra-Fernandez, 2011, 88.) Text mining capabilities are as follows: (1) Clustering analysis which groups and profiles information, (2) Association analysis that makes connections between activities and events, (3) Sequential pattern analysis which discovers repeated successions of events, (4) Classification algorithms that categorize the information, and (5) Predictive algorithms which scores business factors such as credit risk or fraud (IBM Reedbooks 2005a, 63).

Linguisting processing named also Natural language processing (NLP) represents an essential layer of text mining that interprets the human language and transforms it into symbols or numbers that are easier for the computer to interact with. The scope of NLP is to reach the performance of analyzing the meaning of the words. The most common tasks of NLP techniques are information retrieval, information extraction and automatic summarization. Information retrieval is the processes that consist of different tasks that follows to find relevant data and generates metadata. Information extraction is a category of information retrieval that selects structured data with unstructured mechanisms to read texts. The automatic summarization offers the main important topics of the research. (Sabherwal & Becerra, 2011, 88.) Therefore NLP represents an important layer of Text mining because of its functionality to analyze unstructured information in order to gain knowledge. Figure 4 shows the Text mining process.
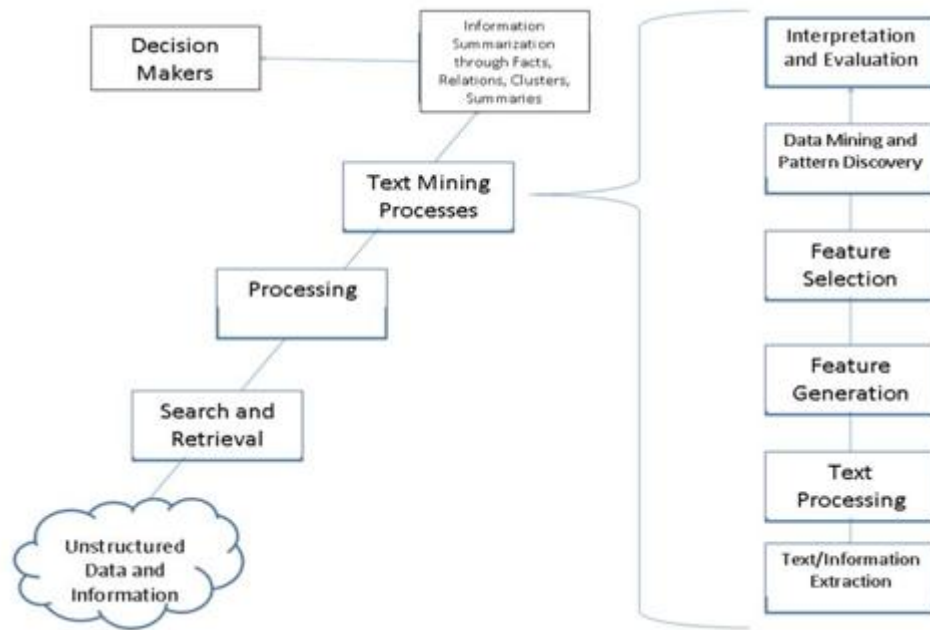
Figure 4. Text mining process (Sabherwal & Becerra, 2011, 88)

Figure 4 depicts the Text mining process which involves the steps shown in the right side. The process begins with the extraction of information relevant for the focused topic of the organization. The next step is text processing where is processed all the text and prepared for feature generation and feature selection. Based on the factors through which the research is conducted, Text mining selects the most suitable information related to the topic of interest. Data mining analyzes the text from many points of view in order to advance understanding of the information to the users which have to interpret and evaluate the results.

World Wide Web (Web) contains enormous amount of data that is increasing on a daily basis. Web represents the technology that evolved faster than any other technology in the latest period, building enormous storages of information which can lead to knowledge development. The rich data which is found on the Web produces a big knowledge discovery. However, its dimensions represent a challenge for the search or selection applications such as data mining. The challenges are: (1) Web is too big for effective data mining because is continuously growing the amount of information and data warehouses cannot replicate or store all data, (2) Web is too complex than a classic text document, (3) Web is too dynamic because of its regular updates, (4) Web is not

specific to a domain because it servers to different types of users, and (5) Web has everything, this does not necessarily represents an advantage because only a small part of the information is relevant for users. (Turban & Sharda & Delen, 2011, 313.) Therefore even if it contains a big amount of information, Web is not one of the best solutions to gain knowledge because its search engines does not always return the relevant data but only some key words which are part of different topics that may or may not relate to user search criteria.

Web mining represents the process to create new insight from the existing information within the Web. Etzioni is the person that coined the term "Web mining" and in today has become a word with a big value which is used in conferences, interviews and journals. It exist three main areas of Web mining as follows: (1) Web content mining which extracts the information found within the Web pages, (2) Web structure which selects the information that is located in the links within the Web document, and (3) Web usage mining which finds the information related to the date when users viewed a particular Web page. (Turban & Sharda & Delen, 2011, 316.) Thus, even if Web represents a wide dimension of information, Web mining technologies succeed to find the relevant information from which users gain knowledge.

6 TECHNOLOGIES ENABLING INSIGHT AND PRESENTATION

6.1 Technologies Enabling Insight and Decisions

Business analytics were developed from basic reporting tools to the current generation, OLAP, ROLAP, DW (Pareek 2006, 17). Business analytics represent the component of BI that create new insights and develop decisions based on the information that an organization relies (Sabherwal & Becerra, 2011, 111). Today, numerous BI tools such as dashboards, scorecards, are centered on analytical tasks. A high-impact analytical tool connects cause and effect, more specific, understands why and plans what next, and delivers insight, knowledge, innovation, and learning (Parr 2009, 185). Therefore, business analytics are relevant not only because are able to create new insights or to develop better decisions but the core is to analyze all the aspects regarding the organizations.

DM or Knowledge Discovery in Databases (KDD) is a BI technology which creates insight from big collections of data. To ensure that this process is successfully done, Data mining uses computer techniques such as statistics, machine learning. (Pareek 2006, 17.) DM has made significant findings over the years, contributing in important medical aspects, bank credit applications offering financial forecasts. DM helps in target marketing and in addition, many techniques are used in insurances and in telecommunications. In Operational Management, DM uses various applications in order to plan, schedule, control quality and management. The forecasting tools are used as well in retail or sales. (Sabherwal &Becerra, 2011, 112-116.) Through these functionalities is pertinent to say that the use of DM processes are suitable for many areas, not only at the strategic management level.

DM operations include as follows: (1) Predictive and classification modeling which is used to focus on a particular objective, (2) Link analysis that finds connections between databases, (3) Database segmentation which segments data in order to be prepared for analysis, and (4) Deviation detection that finds aspects which does not correspond with the norms (Pareek 2006, 17). In the development process DM involves two methods.

The first method describes what happened and segments data depending on the demanded requirements in order to understand specific characteristics of the enterprise. This method includes applications such as data collection, which define the data sources necessary for the research, data description that describe the content of the data sources included in DM, and data quality and verification, which select only the relevant data necessary for the case study. The second method predicts what will happen and analyzes the historical information of the organization to lead to an assumption founded from the inputted specifications. The techniques used in the prediction process are categorized in three methods, statistical that seeks to find the correlations between variables, connectionist which needs an artificial neural networks that is used as a technique to predict or cluster, and rule induction that classifies the data following specific rules. (Sabherwal & Becerra, 2011, 121-122.)

Among the methods used in the development process, to implement a project in DM, is necessary a systematical plan which ensures that the objectives are reached. The most commonly used process is Cross-Industry Standard Process for DM (CRISP-DM) that "was proposed in the mid- 1990s by a European consortium of companies to serve as a nonproprietary standard methodology for data mining (CRISP-DM, 2009)". (Turban & Sharda & Delen, 2011, 207.) Figure 5 illustrates CRISP-DM process that combines six steps in order to facilitate the research of information, planning process and solution deployment.

Business Understanding	Data Understanding	Data Preparation	Modelling	Evaluation	Deployment
Determine Business Objectives *Background* *Business Objectives* *Business Success Criteria*	**Initial Data Collection** *Initial Data Collection Report*	*Data Set* *Data Set Description*	**Generate Test Design** *Test Design*	**Evaluate Results** *Approved Models* *Assessment of Data Mining Results w.r.t. Business Success Criteria*	**Plan Deployment** *Deployment Plan*
Situation Assessment *Inventory of Resources* *Requirements* *Assumptions* *Constraints* *Risks and Contingencies* *Terminology* *Costs and Benefits*	**Data Description** *Data Description Report* **Data Quality Verification** *Data Quality Report* **Exploratory Analysis** *Exploratory Analysis Report*	**Selection** *Rationale for Inclusion / Exclusion* **Cleaning** *Data Cleaning Report* **Construction** *Derived Variables* *Generated Records* *Transformation*	**Build Model** *Parameter Settings* *Models* **Model Evaluation** *Model Description Assessment*	**Review Process** *Review of Process* **Determine Next Steps** *List of Possible Actions* *Decision*	**Produce Final Report** *Final Report* *Final Presentation* **Plan Monitoring and Maintenance** *Maintenance Plan* **Review Project** *Experience Documentation*
Determine Data Mining Goal *Data Mining Goals* *Data Mining Success Criteria* **Produce Project Plan** *Project Plan*		**Integration** *Merging* *Aggregation* **Formatting** *Rearranging Attributes* *Reordering Records* *Within-Value Reformatting*			

**Figure 5**.CRISP-DM Data Mining Process Methodology (Sabherwal & Becerra, 2011, 118)

Figure 5 shows the CRISP-DM process which begins by understanding the objective and information that the organization contains, followed with the processes of modeling and evaluation which ensure the accomplishment of the demands posed by the organization. The scope of CRISM-DM is to support the research, deployment and planning process of an organization. In short, this section is concerned with various technologies which combined, result to a successful support for the decision making process and enable insight creation. Particularly, the research focused on business analytics and DM and their role in supporting decisions.

6.2 Technologies Enabling Presentation

Presentation capability represents the meeting place between the solutions that BI provides and its users. The format in which the information is presented may be

different depending on the role that each user has, what tasks must deliver and what the user´s requirements are. The scope of the technologies enabling presentation is to present the final result to the end-users in a manner that suits their preferences favoring the understanding of the content. A correct presentation which answers to all user specifications, can reduce considerably time spend on decision making process and presents the relevant data without necessity that the manager should study all reports or various screens. Relevant technologies which enable presentation are OLAP, dashboards and balanced scorecards.

OLAP represents an essential technology for BI applications. One of the big advantages of OLAP applicability is that allows enterprises to organize data into cubes. (Ericsson 2004, 87.) The question now is why organizations need to organize data into cubes. The need comes from the fact that cubs allow users to analyze data from multiple points of view as well as permits actions such as slicing or dicing the cube in other cubes which offer a more detailed view about a specific aspect (Sabherwal & Becerra, 2011, 150). Figure 6 shows an example of an OLAP cube along with its functionalities.
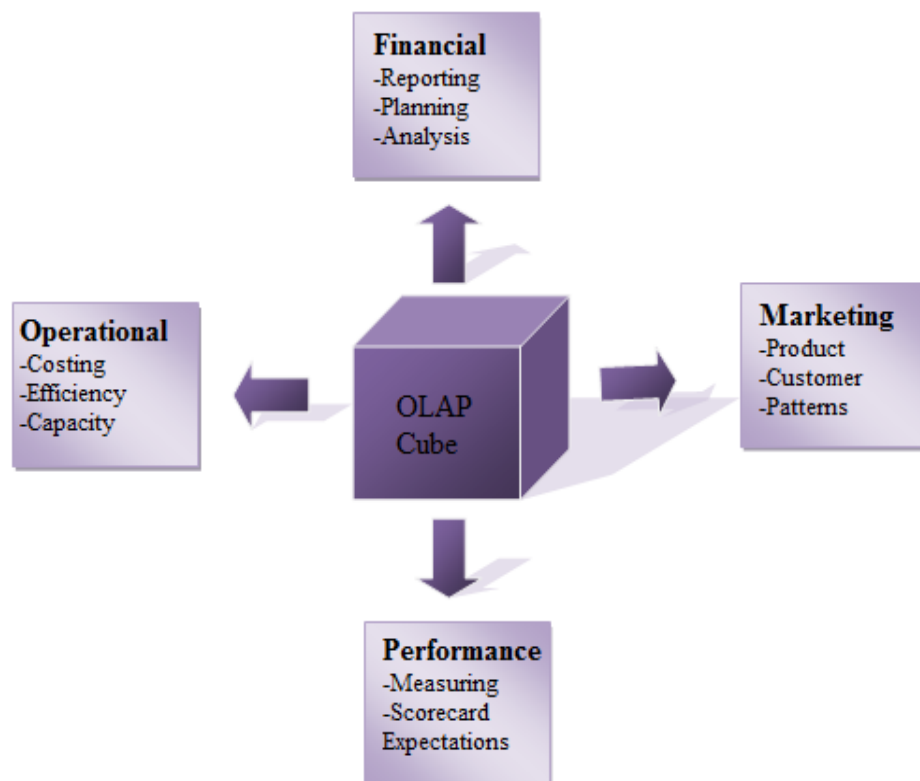
Figure 6. OLAP cube (Ericsson 2004, 88)

As Figure 6 shows, the operations within the cube are divided in four analytical aspects. The first one refers to information analyzed from the financial point of view. In this section, are active the operations such as analyzes, planning and reporting. Through these operations, organizations gain real analytic value (Parr 2009, 185). The second section analyzes data from the marketing point of view and considers in their analysis, customers, products and patterns. These operations help the organizations to gain insight about the specific factors within the enterprise, customers' requirements or products demanded. The third section is about performance and analytics which involve measuring, scorecards and exception. These analytics make organizations focus more on the specific inputs and outputs rather than the general details about the organization (Parr 2009, 227). The last section determines the operational analytical tasks that include costing, efficiency and capacity which aid to implement a vision of the current situation of the enterprise (Parr 2009, 104).

The advantage of OLAP cubes does not only consist in the high analytical capabilities. It helps users to easily navigate through data avoiding slow processes caused because of complex databases. Users can easily choose on what aspects of the organization want to focus and select reliable data which is analyzed from multiple points of view through OLAP solutions. Figure 7 shows an OLAP cube user interface.
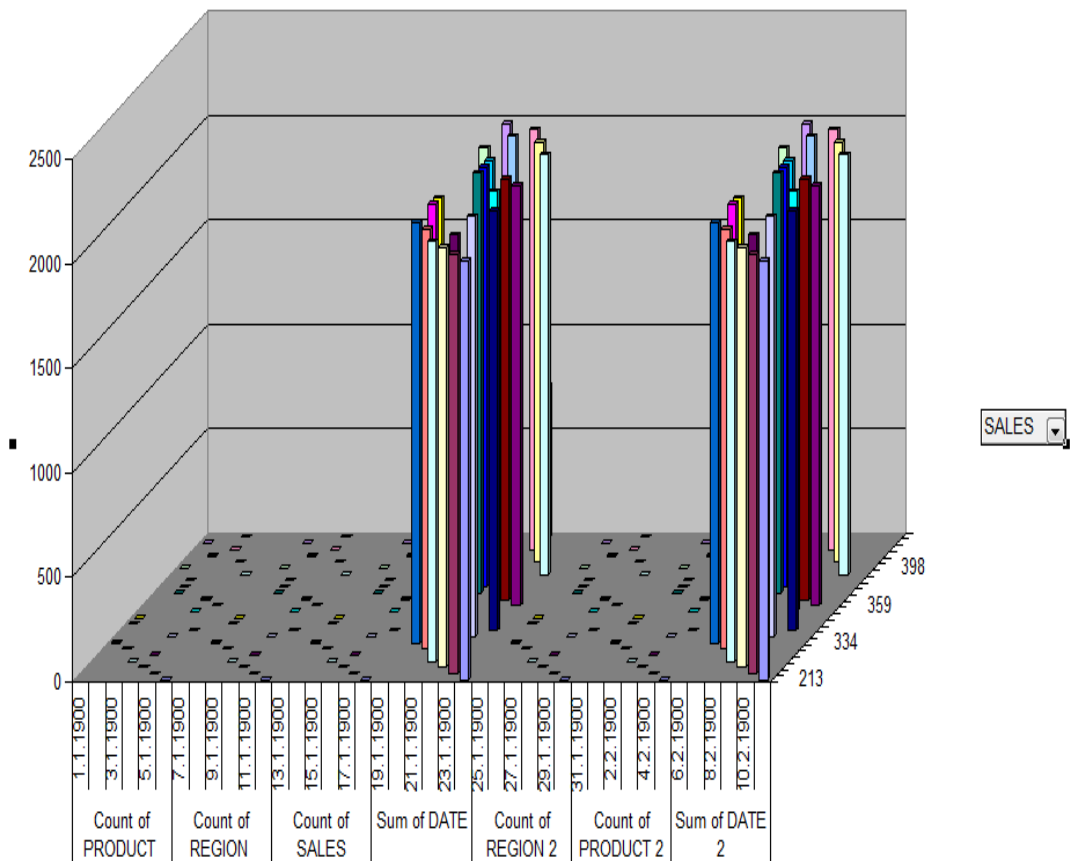
Figure 7. OLAP Cube User Interface

Figure 7 shows how data is analyzed inside of the cube. The case shown in the Figure 7 is related to an organization which analyzes the regions and numbers of products sold in a specific period of time. Users can select between different types of charts depending on what aspect they want to analyze. They can target specific aspects of data and receive more information regarding their choice. An advantage of OLAP is that users do not need to be specialized on IT field to work with these cubes. OLAP cubes can be designed in Microsoft Excel as in the example from Figure NUMBER. The information displayed within the cube is written in a Notepad file and exported to Microsoft Excel which created the OLAP cube. Another advantage of working with Microsoft Excel is that the OLAP cube created can be saved in a Web Page file which facilitates sharing, access and collaboration between the members of the organization.

OLAP contains four types of architectures as follows: (1) Relational OLAP (ROLAP) which stores data into a relational database, (2) Multidimensional OLAP (MOLAP) that

copies data in a storage domain and enables real-time analysis, (3) Hybrid OLAP (HOLAP) that combines different techniques to store information, and (4) Dynamic OLAP (DOLAP) that generates a small size multidimensional cache when users access a query (Howson, 2008, 42.) Therefore through these tasks, OLAP ensures that the information is analyzed from many perspectives and efficiently in order to help users understand the processes within the organization.

The big challenges which organizations need to confront are related to the data analysis. Because of the massive amounts of complex data which the organization contains, are needed many techniques to enable a real time analysis. BI, among OLAP techniques, offers as well visual analytics technologies which are intended to help the users to understand data. The method in which data is visualized is an important aspect of revealing knowledge and understanding the meaning of the analyzed data. Visual analytics uses computer graphics which ensures that users understand the information that the organization provides and helps in the planning the necessary tasks. (Sabherwal & Becerra-Fernandez, 2011, 153.)

Among other applications used in BI processes to drive alignment, one of the commonly technologies used are performance dashboards. These are used to indicate and improve the status of performance as well as to align efforts. According to Ericsson (2006, 66), performance dashboards characteristics are defined by "Three Threes". By the principle of "Three Threes", performance dashboards are grouped by applications which are divided in monitor, analysis and management, layers are grouped in monitoring, analysis and detail information, and dashboards that are strategic, tactical and operational (Sabherwal & Becerra, 2011, 154). Therefore, these "Three Threes" help the employees within the organization to advance understanding of the processes within the business environment.

Figure 8 shows performance dashboards that are are used in many operations such as forecasting, production, inventory, sales, Google Adwords, Facebook Targeted Ads, and Web Pages Directed Traffic (Sabherwal & Becerra-Fernandez, 2011, 155).

Figure 8. Performance Dashboards (Sabherwal & Becerra, 2011, 155)

Usually, performance dashboards are confused with scorecards because of the use of graphical display. Even if they seem that they have the same functionality, dashboards are reporting tools that have the ability to state multiple metrics in a single window while scorecards are applications intended to observe and indicate the performance level and concentrate only on a metric which is compared with an objective. Balanced scorecards consist in two leading indicators, internal processes and intangible assets. Internal processes are related to the internal processes in order to detect the efficiency of the business processes. Intangible assets refer to the factors which supports the business strategy. (Sabherwal & Becerra-Fernandez, 2011, 156.)

Four management processes are included when using balanced scorecards, translating the vision, communicating and linking, business planning and feedback and learning. Translating the vision consists in setting objectives which leads to the business vision that the organization intend to reach. Communicating and linking enable the share of the objectives to all the levels of the enterprise. Business planning ensures that all the initiatives are coordinated and follows the same objectives. Feedback and learning

consist in improving the quality of the services from financial, customer, internal processes and learning perspectives and setting new learning directions. (Sabherwal & Becerra-Fernandez, 2011, 156.)

From the information above can be concluded that the technologies which enable presentation have a critical role to help the user understand the insights of the organization and make BI more accessible to users.

7 BUSINESS INTELLIGENCE SOFTWARE

This chapter focuses on the specific BI software. The chapter goes through the analysis of the software products from Oracle, SAP, IBM, Microsoft, and SAS. These companies constantly work to improve the software BI solutions offered to make BI an optimal choice for different types of business.

7.1 IBM Cognos Business Intelligence

IBM Cognos is the leader in the software performance management.IBM Cognos is a platform which includes technologies and analytical applications that raise management performance and improve decision making. IBM Cognos can be used from the small to the most demanding business planning models. (Riaz, Edwards & Babaran 2009, 14.) Successful management performance is the objective of any organization. Enterprises implement strategies to achieve this objective. Strategies are implemented based on the planned directions of the organizations and follow to maintain transparency of the processes which are developed in the enterprise. Organizations reach a successful performance management when the strategies are different from their competitors. (Verweire, K. van den Berghe, L. 2004.)

IBM Cognos improves performance management by allowing customers to use applications where they can set their own work strategy and methods to achieve better results. This capability of IBM Cognos finds the necessary applications that advance understanding of the processes within the business environment. Through these options, IBM Cognos creates different strategies for each enterprise and successfully increases the management performance of the company.

According to IBM (2010) "IBM Cognos Business Intelligence delivers the complete range of business intelligence capabilities on a single service-oriented architecture (SOA). Use reports, analysis, dashboards and scorecards to monitor business performance, analyze trends and measure results. Cognos BI gives you the information you need to improve decisions."Through the instruments discussed above, IBM Cognos

ensures that users receive relevant data that corresponds with the objective of the work. IBM Cognos extends BI capabilities with analytics that facilitates user to understand, gather or analyze information. A single platform for the work environment represents a benefit for any organization. Users can monitor, plan, or access information that help in decision making and in the daily tasks of the organization.

Figure 9 is a screenshot that displays the IBM Cognos user interface.
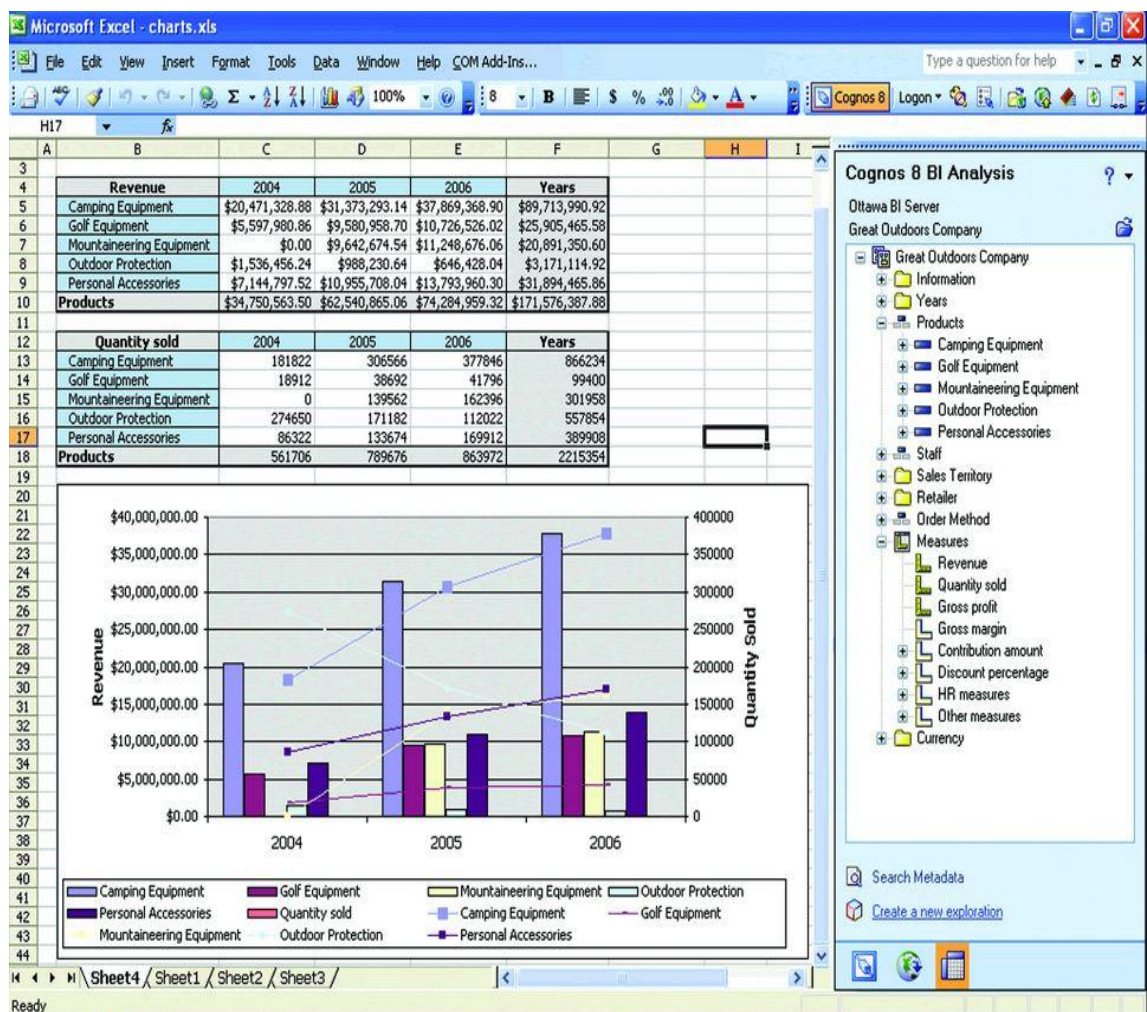
Figure 9. IBM Cognos user-interface (IBM Corporation 2011)

Figure 9 displays IBM Cognos working environment. Users have the possibility to use multiple types of analytical or planning tools to manage data. Functions or data can be added depending on the user tasks. User has the possibility to share or access information whenever needed. Cognos is flexible to the requirements of the business environment while respecting the preferences of each user. With a simple click on a

specific field, Cognos offers all relevant data which ensures that users make informed decisions.

IBM Cognos has many advantages when is implemented in an organization. Improves financial and operational planning of enterprises, using the capability to manage the strategy of an organization into small plans which are easier to accomplish and understand. (Riaz, Edwards & Babaran 2009, 14.) Today, information and how effective is used within the organization is a crucial element for the business performance management. IBM Cognos planning ensures that the proposed objective of an enterprise is achieved providing tools to correctly analyze the information and monitor the progress achieved through time and other related aspects.

IBM Cognos software is suitable for any type of user within the business environment. Executives have the opportunity to monitor business performance and to focus on details which help in making more informed decisions. The tool provided by IBM Cognos planning helps business and financial analysts to analyze data from multiple points of view. This analysis leads to an improved quality of data for executives and for the rest of users that have access to that data. Business users can benefit from this software to pursue business-specific analysis by themselves without the help of any specialists. This capability is accomplished through the tools that IBM Cognos software provides in order to facilitate many tasks from the business environment. (IBM 2011.)

7.2 Oracle Business Intelligence

Oracle Business Intelligence represents a set of tools that covers the needs of the business environment. The tools are designed to offer scalability, reliability, performance, and can deliver insight to the users of an enterprise leading to improved decisions. (Oracle 2010.) Every organization aims to raise the operational and financial progress of the business in order to set new strategies depending on the achieved goals. The question now is how Oracle BI interferes in the business environment and helps organizations to achieve the proposed objectives.

Figure 10 displays some of the functionalities integrated when accessing Oracle BI.

Figure 10. Oracle BI framework. (Rittman Mead Consulting, 2010)

As Figure 10 shows, Oracle BI framework offers different dashboards and reports that can be customized depending on the user preferences. Oracle BI provides information about every aspect of the enterprise. User needs just to click on the followed target and more data will be displayed. The user has the possibility to change language, add comments, share information and gain knowledge from other users. Scorecards are used to see how aspects of the enterprise are developed over time and monitor the registered progress. In other words, with Oracle BI the user creates its own business environment.

Oracle BI offers a common infrastructure for the applications provided in order to minimize costs and maximize productivity. It provides a unified business model where data is clear and visible across the enterprise. Oracle BI framework creates a powerful user experience integrating many tools used in all the organization. The simple

configuration of the system optimizes the performance and makes Oracle BI best-in-class scalability, reliability and performance. (Oracle 2010.)

Figure 11 illustrates Oracle BI components:
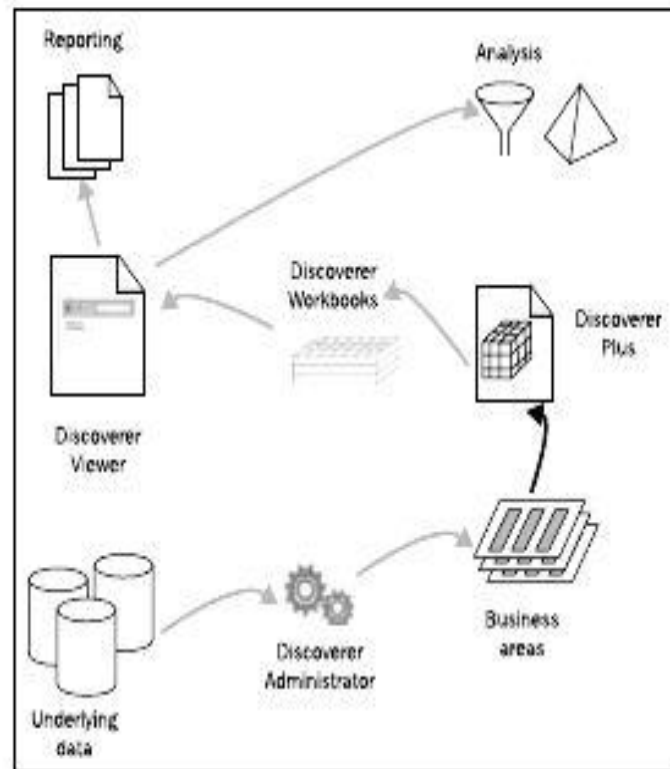
Figure 11. Oracle BI components (Iuly 2010, 28)

As Figure 11 shows, Oracle BI is used to transform data into information. The process starts with Discoverer Administrator that uses available data from the organization in order to create a business oriented view. After the business oriented view is created, data is distributed in Business areas that are categories of data used by Discoverer Plus to create workbooks. Discoverer Viewer is optional, providing better possibilities to analyze and report data. (Iuly 2010, 28.) Through this process data is analyzed and are offered better perspectives in users' decision making. Oracle BI provides all the necessary instruments to anticipate market requirements and align processes across global networks (Siddiqui 2010, 3).

7.3 SAP BusinessObjects BI Solutions

Organizations face big amounts of data that are constantly increasing. This data is retrieved on systems from different geographical areas which may not be compatible with each others. To make good decisions, organizations search for solutions to fit all the amounts of data into a common database accessible from multiple places in order to be analyzed. Among competitors such as Cognos, Microsoft that provides solutions to these issues, SAP represents an optimal choice. (SAP, 2012.)

SAP is the leader in business software solutions. Suitable for any type of organization, helps enterprises to effectively run business. SAP solutions are suitable for all the members of an organization. The benefits of SAP solutions are to guide users to operate efficiently, adapt continuously and grow sustainably. (SAP, 2012.)

As is pointed out by Wolfgang (2009, 8), SAP "is designed to help you collect the right information and run reports in real-time." With SAP BusinessObjects BI Solutions, organizations reduce the time spend to research relevant information, and focus more on achieving goals. Real-time reports make data available when is demanded without the need to wait. This can be assumed as an important advantage for organizations, helping to improve the decision-making process or customer-services. SAP BusinessObjects BI Solutions offer tools to analyze and report data. Through these tools, users gain a clear view about the progress of organization and can state future objectives to achieve.

SAP Business Objects BI suite can be grouped as:

- Comprehensive: Offers tools such as reporting, analysis, dashboards which help BI users to achieve an improved understanding of the data within the organization;

- Open: SAP enables multi-source universes which facilitate users to find the relevant information from different sources of the enterprise in a single report.

- Self-service: SAP offers predefined layers which help BI users to create applications without the need of a specialist.

- Performance: SAP brings in-memory computing technologies for costumers that are meant to improve query performance.

- Mobile: SAP raises the value of the use of mobile devices in the business applications by delivering a support for mobile devices. (BARC GmbH, 2011.)

Figure 12 displays a framework of SAP BusinessObjects BI OnDemand.
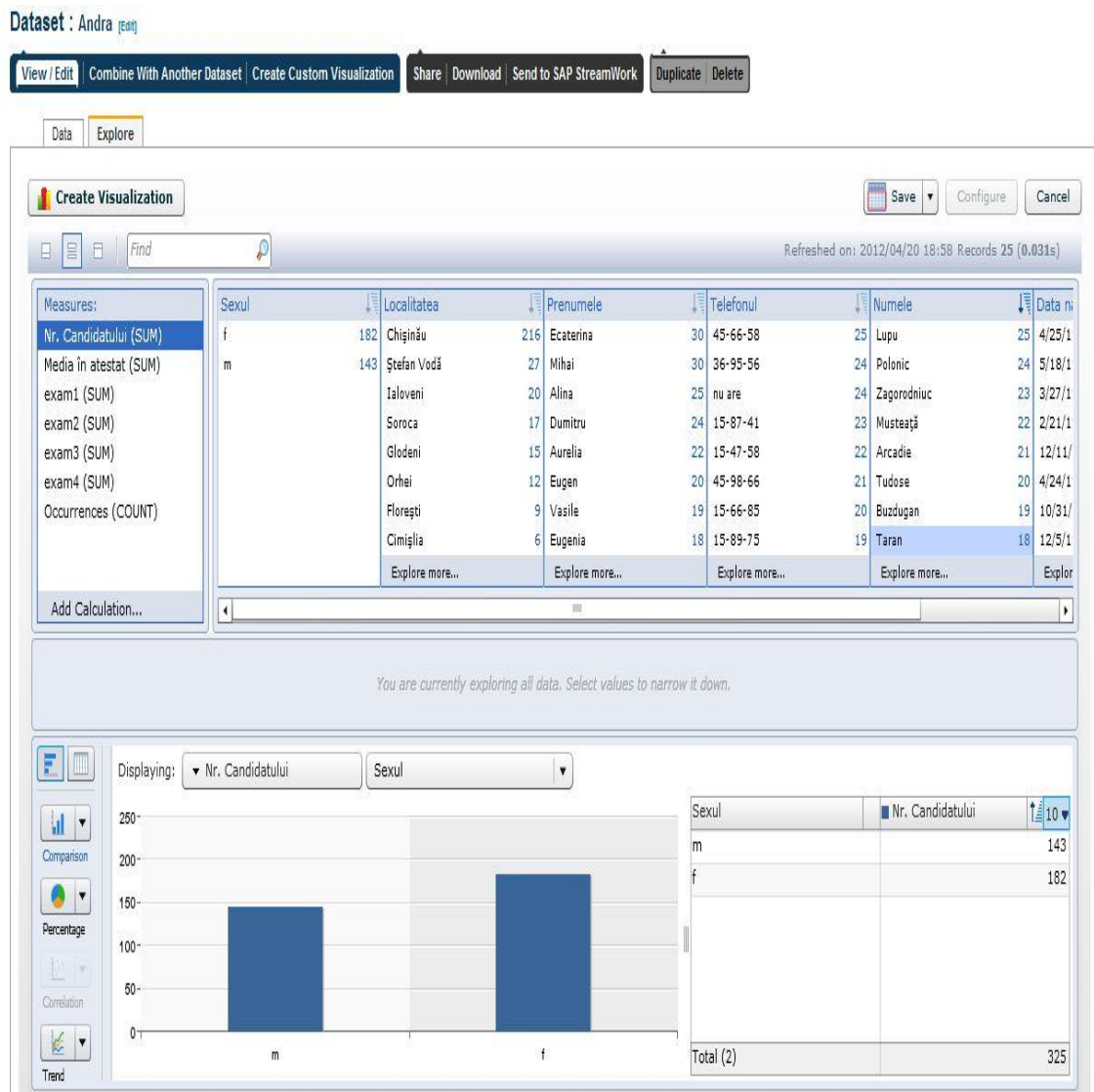
Figure 12. SAP BusinessObjects BI OnDemand framework

SAP BusinessObjects BI OnDemand allows users to insert data in different formats such as XLS, XLSX, and CSV in order to create reports. These reports can be analyzed from different aspects. Figure 12 is an example of a report created from an XLS file.

SAP BusinessObjects BI display the inserted data and gives the possibility to explore data and choose between layers the most suitable that can offer a clear understanding of the content. Users can save or share reports and have access to them in any moment. Reports can be refreshed to monitor the performances in real-time. Users while view or interact with a report can collaborate with other members, post feedback, and see other discussions. In addition, it provides the capability to set categorized access to some of the functionalities depending on the group of users.

The success of an organization depends on the efficiency of the software solutions that it uses. SAP is known as a leader in the world because it provides business software solutions which increase the progress and performances within the enterprises. (IBM Redbooks 2005, 2.) Therefore, SAP solutions can be considered an efficient software solution in the BI applications.

7.4 SAS Business Intelligence

According to SAS Institute (2010) "SAS helps organizations anticipate and optimize business opportunities. We do this through advanced analytics that turn data about customers, performance, financials and more into meaningful information. The result? Fact-based decisions for undeniable bottom line impact- this is how we transform the way our customers do business."

Today, businesses have to face large amount of data. Data plays an important role in drawing the future directions of the organizations. SAS offers tools to analyze data and offers users the status of the processes that happen within the organization. It provides past and current information and predicts the future of the enterprise identifying the discrepancies between what has been achieved and what was supposed to be achieved until the current situation. The complex analytical suite that SAS provides makes it suitable for any business industry.

Figure 13 displays some of the tools of SAS BI.

Figure 13. Enterprise SAS BI (SAS Institute 2011)

Figure 13 shows some of the facilities that SAS BI provides within an enterprise. Key metrics indicate users about the progress achieved in relation with the objectives followed. Forecasting tools are used to define the progress achieved within a certain period of time. SAS tools role is to make users to understand better where the business enterprise stands, what are the factors that influence the progress and how much effort is needed in order achieve better results.

As Thierauf (2001, 166) points out, SAS has the capability to analyze structured and unstructured data with the same efficiency. Through this capability, SAS helps the organizations to gain insight about the processes that happened within the enterprise and make business more successful. Real-time analysis is another quality that SAS provides which enable organizations to gain more time to focus on other aspects of the business, make decisions faster or respond promptly to users' demands.

SAS BI components can be divided in four categories:

- Enterprise Business Intelligence- combines BI capabilities with SAS analytics in order to create solutions to the demands posed by the business environment.

- Office Analytics- facilitates members of the business environment to use the capabilities of SAS Analytics through a Microsoft Office interface.

- Visual Analytics- used to make users understand big amounts of data through visual outputs.

- Visual BI- offers a friendly-user interface to make users understand the processes within the organization. (SAS Institute 2010.)

Through these components SAS ensures that all the business processes within the organization are made based on analyzed data which offers enough knowledge to make inspired decisions and to increase performance.

7.5 MicroStrategy

MicroStrategy is one of the most important platforms of BI. It can be defined as an advanced reporting tool used to analyze and compare data, forecast or drill down multidimensional MicroStrategy Reporting Suite. It has the role to real-time monitor performance indicators. These reports allow users to select the indicators depending on the concerned areas or focused objectives. Reporting data is filtered depending on the user specifications. The results shown in the report serve as support for decision making or for fundamental operations effectuated within an organization. Data is displayed in a variety of formats such as horizontal charts, tri-dimensional graphs, bubble charts, and other types that can suit user preferences. MicroStrategy Reporting Suite is developed to offer users multiple types of reporting tools for any type of analysis. (MicroStrategy, 2012.)

Through the reporting tools, MicroStrategy Reporting Suite offers dashboards, office instruments through which users can edit their reports, mobile application platforms that facilitates enterprises to build mobile business intelligence applications and distribute services (MicroStrategy, 2012). The role of dashboards is that enables users to see

analyzed data from many perspectives. Dashboards can be accessed through MicroStrategy Cloud Personal which offers a platform where users can upload Excel files in order to convert them into dashboards.

Figure 14 illustrates how MicroStrategy Cloud Personal works.

Figure 14. MicroStrategy Cloud Personal

Figure 14 displays the options that the user has in MicroStrategy Cloud Personal platform. This platform can be accessed by creating an account or by signing in through Facebook or Twitter account. The user needs to upload the file meant to be assessed and set the criteria in which data is analyzed. The left side of the figure shows the uploaded data while the right side shows an example of a type of dashboard which can be changed depending on the preferences and scope of the analysis. Among other facilities, the user can share or save his work. The account can be accessed through tablets or computers without the necessity of installing any software.

MicroStrategy has many efficient products which are used today. Depending on the objective of use, products can be categorized in tasks to develop, deploy or report. One of the most important products regarding the deployment category is MicroStrategy

Intelligence Server. BI server as MicroStrategy (2012) refers at as the "industry´s most advanced, scalable, secure and robust business intelligence server", provides a safe channel where users can share and manage data or analyze and monitor applications. Micro Strategy Intelligence Server´s importance consists in including all types of BI in a centered platform which is continuously available and ensures maximum performance for all users. DM and SAP services are part of Micro Strategy Intelligence Server. (MicroStrategy 2012.) Micro Strategy Intelligence Server provides tools to analyze and develop reports which can be performed by inexperienced users with lack of knowledge. Multiple advantages are achieved by combining the capacity of DM to analyze data in order to gain knowledge with SAP software facilities to manage the areas and resources of an enterprise. One of the most important advantages of using Micro Strategy Intelligence Server is that offers a single platform that integrates BI applications. This facility reduces considerable the costs of the implementation of BI system.

An element of Micro Strategy Intelligence Server is MicroStrategy MultiSource Option. Belongs to the development category and is an extension that has the role to integrate tasks from multiple origins to a single platform that Micro Strategy Intelligence Server created. It is based on creating a single business model that comprises data from different data sources such as DW, DM, databases. MicroStrategy MultiSource Option extends the role of ROLAP regarding data manipulation by including a vast dimension of data. (MicroStrategy 2012.)

MicroStrategy MultiSource Option provides an advance understanding of the information which an organization stores because gathers data from multiple databases. The gathered data, when analyzed, is more comprehensive and effective in the decision making process.

Figure 15 illustrates how MicroStrategy MultiSource Option is applied in the business environment.
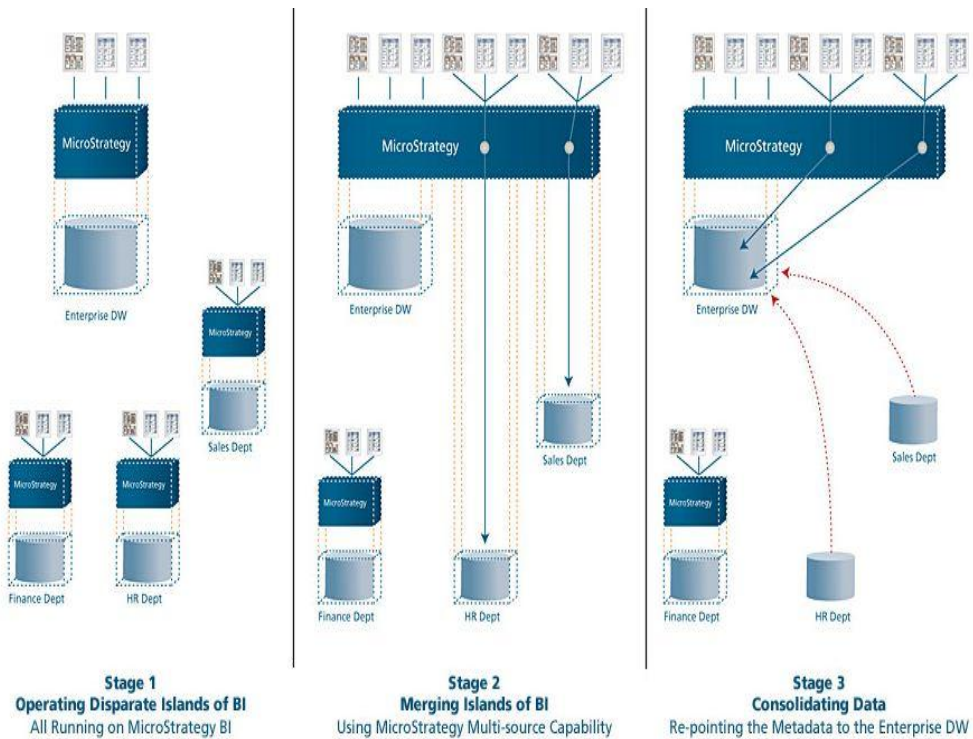
Figure 15. MicroStrategy MultiSource Option Development (MicroStrategy 2012)

Figure 15 shows the different stages of the development of MicroStrategy MultiSource Option. The first stage indicates the data source which belongs to specific sectors of the enterprise. Each data source comprises all the information which the organization accumulated over time. The second stage points out that Microstrategy can collect data from multiple sources without the need of any changes in the systems of business environment. The third stage shows that data can be safely transferred to a single source which can contain all the information from debases by simply indicating the main storing source of information. (MicroStrategy 2012.) Combining all these steps MicroStrategy MultiSource Option offers rich information collected from all the sources of enterprise.

8 COMPARATIVE ANALYSIS OF BI SOFTWARE

The goal of this chapter is to analyze the BI software solutions to achieve the objectives of the second research question. This chapter compares the software solutions to offer organizations the possibility to choose the suitable BI applications depending on their specific business needs. The chapter analyzes the advantages and disadvantages of some BI software solutions. An important aspect is that many of the BI solutions are provided by the top IT vendors such as SAP, SAS, MicroStrategy, Oracle, and IBM, which are notable for their performances.

8.1 SAP Business Objects, Oracle Hyperion and IBM Cognos comparison

SAP is a German company founded in 1972 and it is well known in the software industry. It is classified as the fourth largest in the world due to the fact that in 2007 acquired Business Objects which determined a big growth in the market. IBM dates from 1889. It is known as one of the first IT software companies with many awards. In 2007 IBM bought Cognos which increased its success. Even if both, SAP and IBM have an enormous success within the organizations and in the market sales, they continue to compete against each other offering a variety of capabilities which are designed to increase the performance within an organization. Figure 16 shows IBM and SAP components and makes easier to compare the two software solutions. (GoliInfo 2012.)
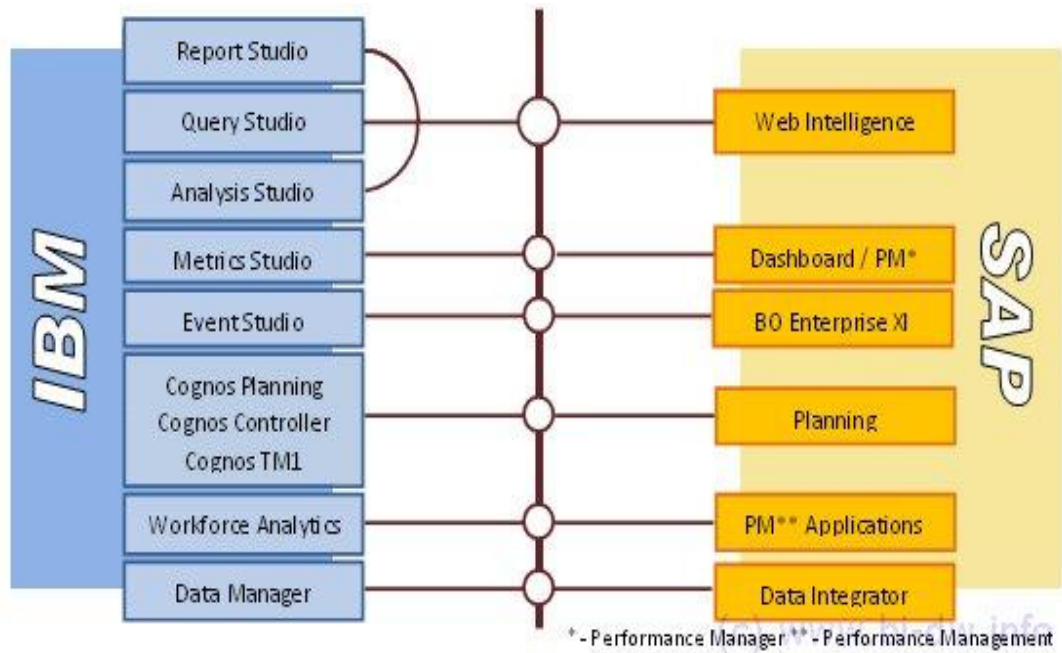
Figure 16. IBM VS SAP (GoliInfo 2012)

Figure 16 shows the equivalent applications of IBM and SAP (GoliInfo 2012). As it can be seen from the Figure 16, IBM offers Report Studio, Query Studio and Analysis Studio. All three applications are equivalent with Web Intelligence application that SAP offers. The rest of the applications that IBM and SAP include have the same capabilities within the organization.

IBM Cognos is a system developed on a Service-Oriented Architecture platform. It enables its users to transform and publish data in many formats and languages and access them from different sources such as mobile, e-mail. The features that IBM Cognos provides are mature, stable and offer many planning capabilities. Most of the persons use IBM because of its capabilities to deliver fast and accurate access to the data within the enterprise and that the analytical tools are all compatible. The weaknesses of IBM Cognos consist in the fact that it does not offer support for ETL and data quality software. Even if new upgrades of IBM Cognos are developed, they are not solving these problems. Cognos 8 does not support offline reports and analyses. As Figure 16 shows, IBM Cognos developed three applications which are equal with one of the SAP applications. The connections between Cognos 8 and 7 cause issues to the

work. (GoliInfo 2012.) In short, IBM Cognos is an intelligent platform which has weaknesses but is still one of the best systems to use within the organization.

On the other hand, SAP Business Objects improves the efficiency of the organizations by providing tools which aim to easy find the relevant data that corresponds with the user's requirements. It is used make fast decisions because of its good scalability. It enables organizations to acquire insight because of its transparent structure. Other important aspect is that it saves all the data with the same format which helps the users to have access to that information faster. SAP disadvantages consist of the data results which are discrepant. It is developed from different applications which do not share the same technology. The service software allows users for small changes, the rest of the changes must be done by IT developers. (GoliInfo 2012.) Therefore, even if SAP solutions offer great possibilities within the organization, some of the weaknesses may reduce its success.

In contrast to SAP Business Objects, Oracle Hyperion is a leader on the market. The issue is that Oracle started to invest more on Oracle BI Enterprise Edition letting and less on Hyperion. The advantage of Hyperion is that it is considered "a leader in enterprise performance management (EPM) and business performance management (BPM)" (GoliInfo 2012.) Therefore even if Oracle does not invest anymore in Hyperion, still this software solution is a market leader in finance and office. The issue of Hyperion is that its relational database stores the metadata from Hyperion Planning and Financial Management in different formats. Hyperion's functionality is limited. Multiplied applications are used in the same time. Other applications have different architectures. In short, even if Hyperion has different issues compared with SAP Business Objects, its customers continue to buy this software and consider a good investment within the organization. (GoliInfo 2012.)

It is difficult to estimate which one is these two software solutions is the best because both of them have weaknesses and strengths in different aspects. Therefore the comparative analysis of IBM Cognos and SAP Business Objects helps organizations to choose one of them depending on what the business needs are and how capable are these two software solutions to cover the specific requirements.

8.2 MicroStrategy and SAS comparison

"MicroStrategy serves thousands of the world's leading companies, including 7 of the top 10 global retailers, 9 of the top 10 global pharmaceutical companies, and 8 of the top 10 global telecommunications companies" (Business Intelligence Software Comparison 2012). MicroStrategy was founded in 1989 and in 2008 become leader of Gartner's Magic Quadrant for Business Intelligence Platforms. It includes MicroStrategy Intelligence Server which is known as the most innovative, strong and safe BI server. It enables organizations to report, examine and monitor data. Users can choose the data format which is more suitable for their organization. It offers dashboards, scorecards, advanced analytical tools to facilitate users to understand data quickly. Improves the decision making process by providing reporting systems easy to manage and to use in the daily operations. Through the tools that MicroStrategy provides, users can predict and analyze the operations within the business environment. It includes in a single platform all the reporting and analysis tools within the organization. These tools can be accessed through different channels such as Web browser, Microsoft Office.

MicroStrategy, SAS was developed in 1976 and its solutions "are used in 109 countries. Customers include 91 of the top 100 FORTUNE Global 500 companies" (Business Intelligence Software Comparison 2012). SAS represents the leading force in business analytics industry and continuously develops new solutions to manage data and diverse operations such as financials, product performance, within the business environment. The users which have increased capabilities in SAS programming can benefit from this system at its maximum capacity. SAS provides a multitude of predictive and analytical tools, data mining, text mining, experimental, forecasting and many other tools to improve the efficiency within the organization. Enables organization to create new insights and improve decisions. Presents data using various tools such as graphs, charts to help users understand the content. SAS is continuously evolving to help organizations to reach their objectives easier day by day. (Business Intelligence Software Comparison 2012.) Therefore SAS success is increasing due to the fact that its solutions are increasingly used within the business environment. SAS facilities lead to improved performance, quality of the decisions and help enterprises to gain insight.

Both MicroStrategy and SAS are two leading software solutions which maintain their success from the advantages that they bring within the business environment. From the solutions that they provide can be seen that they are not identical. Therefore, organizations choose the most suitable one depending on what business they lead and how these two software solutions can be applied within the enterprise.

9 BUSINESS INTELLIGENCE DEVELOPMENT TRENDS

As IT field is continuously developed in the last years and BI depends on its applications, new trends started to evolve. This chapter presents recent trends in the development of BI applications and their conceptual use. These trends include Operational BI, Real-Time Analysis and Social Intelligence which are discussed in the following sections.

9.1 Operational BI

Decision making is found in people's daily actions. Decisions are made based on the information from our disposal and can have a big influence in important sectors such as politics, finance, education and medicine. The correctness and reliability of information influences the quality of the decisions. Information value is related to the area of interest of each user depending on the objective for which it is used. Inevitably, everyone necessitates information in order to make inspired decisions. According to the previous chapters, BI, among the functionalities that it has, plays an important role in the decision making process. For the scope of its use, BI contains tools that facilitate tasks within the strategic level but also for the operational level. This subchapter focuses on the importance of operational BI.

Howson's (2008) suggests operational BI for other fields that does not necessarily lift BI to the strategic level. This topic is relevant due to the fact that BI solutions are increasingly used in many other fields than strategic management. Howson (2008, 4-5) points out that even if in the recent years BI has mostly focused on the strategic decisions, this approach has a critical role in the everyday operations of an organization. The fact that BI has a considerable importance in daily tasks of an enterprise motivated the research regarding operational BI approach.

Operational BI is a recent category of BI which offers real-time information based on the analysis of data in order to help users in the decision making process. Front-line users that do not need to have access or review information to finalize a task, use

operational BI that manages and optimizes business operations and performs daily reports. The fields in which Operational BI is actively used are, for instance, travel agents and airlines that monitor the flights and find connections in case that some of the flights are delayed. In hospitals, Operational BI checks the available staff than can intervene in case of emergencies. Restaurants approximate how much time customers have to wait for a table. This functionality is established by parameters which include, for example, the number of patrons linked with the usual time to dine. Walt Disney World´s Magic Kingdom uses Operational BI in order to find solutions, such as Fast Pass tickets, which enables visitors to avoid long lines for a ride. (Howson, 2008, 4-5.)

In brief, Operational BI represents an important system that supports many of the day-to-day tasks which do not involve strategic management. It consists of data analysis to find solutions to the concerning issues so that organizations achieve their proposed objectives. One of the most important aspects regarding Operational BI is that it offers real-time solutions which definitely improve the decision making process and the quality of the services that enterprises provide.

Another important research regarding the use of Operational BI is that of Pareek (2006) which discuses about the benefits that this approach brings and mentions about applications which enable these capabilities. These aspects are relevant for this work because they help to provide a clear view about the use of Operational BI approach in the existing economy and motivate its importance today.

According to Pareek (2006, 157), today most enterprises need to be able to deliver results even if the economic situation is not satisfactory. In this situation, the focus point of most organizations is to satisfy the requirements of the clients and to gain their confidence that can lead to growth in revenue. Other important factors that enterprises have to confront are competitive pressure, investor demands to raise profitability and government regulations. The most effective measure to face these factors is to increase understanding of the processes within the enterprise and to be able to accommodate with the changes within the business environment. Operational BI is based on the real-time analysis that facilitates the operational decision making process. Operational BI offers real-time analyses to the end user and studies if the performance reached is compliant with the objectives of the work. An Operational BI system consists of information delivery, serving and integration. These tasks are enabled through

operations, such as, forecasting, budgeting, dashboards, Web-based information systems focused on the process level rather than at the data. Metadata is a relevant tool of BI which shows an explicit overview about the analyzed data which participates to the decision-making process. Through these tools, Operational BI ensures that users have access to real-time information and everyone can use BI virtually. (Pareek, 2006, 157.)

From these two points of view of Howson (2008) and Pareek (2006), it can be concluded that Operational BI represents an important extension of the BI approach. Even if it is not a mandatory system within the organization, taking into consideration all the facilities that provides within an enterprise it is pertinent to say that Operational BI is necessary for the multitude of aspects that companies need to face today.

9.2 Social Intelligence

Social media is part of our daily lives. Each person uses different online applications to communicate with friends, family, share interests and create a personal collection of information which either can be shared or not with other persons. Social media is not only a trend but has become, in the last years, an aspect of life. Applications such as Facebook, LinkedIn and Twitter are examples of social media. These online applications contain information about their users, preferences, dislikes, and other personal thoughts.

Organizations use social media in order to recruit personnel, transfer or receive information in real-time, make decisions, perform online training, and other related business activities (Hilbrand 2010, 7). Trough social media enterprises can recruit staff for a specific job, find the candidates faster through different social networks where people can upload their personal information, such as studies, work experience, hobbies and they are selected according to the organization preferences (Turban & Sharda & Delen, 2011, 657).

Many of the enterprises today use social networking through which performs training activities to groups of people situated in different areas of the world (Turban & Sharda & Delen, 2011, 657). Local and federal agencies use social media to receive messages

in real-time (Hilbrand 2010, 7). Social media encourages collaboration, which is an important factor for the business environment. Through this advantage organizations learn about their customers' expectations, collaborate with their business partners, suppliers and make more informed decisions based on these factors. Through the success of these advantages, BI created a new extension, Social Intelligence. The question now is how BI software adapts with the social media applications to ensure the variety of advantages discussed above.

Through its DM techniques, BI has the capabilities to analyze structured and unstructured data, forecast, plan and schedule, which represent important aspects within the social network. DM techniques understand the characteristics of the information in order to gain competitive intelligence. BI links the clients' requirements with the processes within enterprise in order to set a relationship between them, where clients show their preferences so that organizations understand better their customers' expectations. This process brings benefits for both, client and organization. Another benefit is that organizations give feedback to their clients or suppliers in real-time through which they gain their trust. BI tools create a network at the business level where employees can target their interest or post comments on a related work or opinions about the output of a task which lead to improved performances. (Sabherwal & Becerra, 2011, 52.) Figure 17 is an example of a conversation with the use of BI systems incorporated in social media sites, such as Facebook. (Hilbrand 2010, 7.)
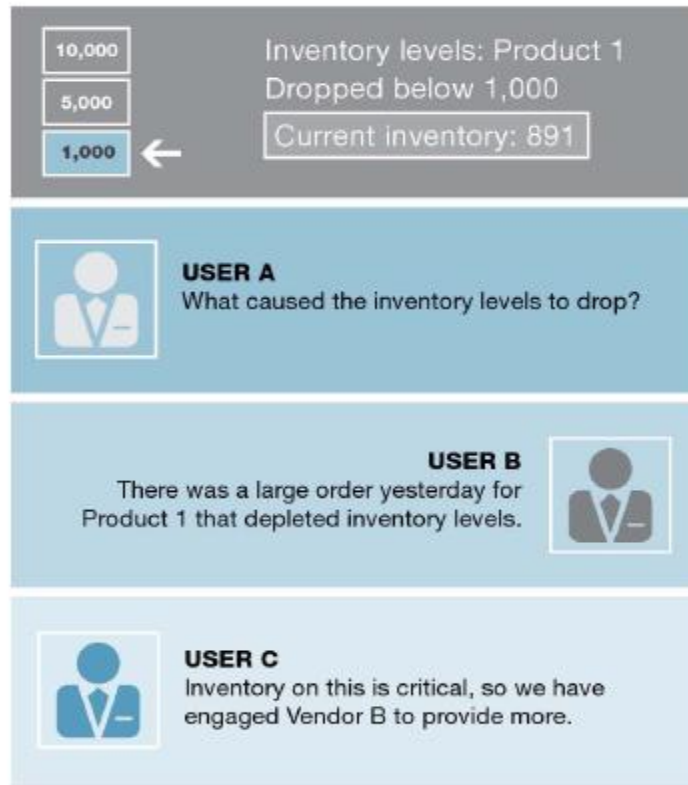
Figure 17. Chat frame of BI incorporated in social media sites (Hilbrand 2010, 10)

Figure 17 shows how the frame of a chat looks if BI is incorporated in social media sites. A few observations need to be made about the efficiency of this frame. As is displayed, the first block offers details about the inventory of the organization. DM can easily perform these tasks about inventory, costs, revenue and many other aspects involved in the business environment. In the case shown above, the discussion includes three members of the enterprise which give their comments regarding the situation of the inventory. This situation can be adapted to other aspects within the enterprise. The benefit of this application is that encourages users to collaborate with each other with the scope to improve performances. The more persons which post feedback better performances are achieved.

Social Intelligence is a new type of BI which analyzes shared data and relationships in order to gain information which can be used to improve the progress of an organization. The objective of Social Intelligence is to make BI interactive, increasing the ease of use

and empowers collaboration between users. All these operations are meant to increase business value and the progress of organization (Hilbrand 2010, 10).

9.3 Real-Time Analysis

From the application point of view, this trend is related and can be used within Operational BI. It includes a set of techniques for intelligent analysis of data performed in real time. It can be used on operational and well as strategic levels of decision making. In this way, Operational BI is often technically based on real-time analysis.

Today´s business environment encounters many challenges for the organizations that try to remain at a competitive level. One of the biggest challenges for the organizations is to make fast decisions. As discussed earlier, decisions are the most important aspect which shapes the figure of how the future will look. Moreover, inspired decisions rely on a background rich of knowledge achieved from a multitude of information.

Today, organizations choose to invest in BI software for their business because converts information into knowledge and supports the decision making process. (Pareek 2006, 156.) Enterprises need reliable information which guarantees the quality of the decisions. Even if companies make informed decisions this does not always ensures a successful result because intervenes the factor of time. Therefore information must be made accessible in short time and must depict the current situation of the enterprise.

According to Turban & Sharda & Delen (2011, 360) BI provides real-time EDW that accomplishes these needs. EDW includes the current data of an organization and creates business value. EDW provides a database that analyzes and reports data in order to support managers to improve decisions. Because of the exceeding amount of data combined with the requirements of analysis in real-time, arises the necessity of an upgrade. Real Time Data Warehousing (RDW) or Active Data Warehousing (ADW) is a feature of EDW which is defined as "the process of loading and providing data via the data warehouse as they become available". (Turban & Sharda & Delen 2011, 360.)

Therefore the difference between EDW and RDW consists in the fact that, RDW incorporates current data used in real-time analysis. This process makes possible that the current information can be selected in order to be analyzed. The advantages of RDW offers real-time information for the decision making process and creates a repository to support strategic and tactical decisions. Other advantages of RDW are that creates leverage effect, predicts events based on the accumulated data and sustains decisions within the organization. (Turban & Sharda & Delen, 2011, 360.)

The capability of RDW to provide real-time information necessary for the decision making process, represents an important advantage for the organizations. The term "real-time" has different value for its users. This depends on the scope of the work and information latency needed. However, most of the enterprises see this capability as a benefit which helps them to take advantage of possible opportunities or to make fast decisions. Real-time BI makes users to advance understanding of the processes within the enterprise and improves real-time decisions which can be done by any employee without considering their function or location. Real-time solutions raise performance and profitability of the organizations and makes business processes faster. (Pareek 2006, 157.)

Therefore it can be concluded that through real-time analysis organizations responds effectively to the business tasks and can predict the future customer requirements. Enterprises gain insight about their clients, increase the level of perception, so that the organization will know which opportunities to choose in order to increase the revenue and progress.

10   DISCUSSION AND CONCLUSIONS

The objectives of the thesis were to analyze BI information and communication technologies and their role in the strategic management of an organization. In addition the research examines BI software solutions and compares them in order to offer different perspectives of their use for the organizations which are interested to invest in BI systems. The thesis sets the base of the research topic by beginning with a study about the background of BI. In addition, the thesis evaluates the role and capabilities of BI in the strategic management, presents the strategic goals and factors which increase the demands of this approach. Through this evaluation, the work continues with assessing a number of BI technologies and applications and discusses about the BI development trends.

This thesis is focused on the BI concept used in the strategic management. To understand the role of BI within the strategic management of an organization, its technologies and capabilities were studied. In addition, to provide perspectives of use of BI software solutions, a comparative analysis was made. The role of BI within the business environment was studied. In addition, were discussed the factors which increase the prominence of BI within the organizations.

BI aims to support organizations in their decision making process through a series of technologies that respond efficiently to business demands. The scope of BI is to help decision makers to understand the processes that take place in an organization and to overreach other business competitors. BI technologies are dependable on the major vendors of IT area. Due to the fact that IT field has continuously been developed in the last years, BI technologies have reached high performances that automates most of the operations within the organization. BI acts efficiently to ensure that the objectives of the organization are reached and that future strategic goals are set according to the current situation of the enterprise.

BI systems provide many benefits. The first advantage is that through BI solutions users make informed decisions based on the knowledge accumulated from the reports, statistics, analyses and other tools that BI provides. Another advantage is that BI offers real-time information to enable users to find real-time solutions for the business

demands and take advantage of the eventual opportunities. Through BI, organizations gain insight, understand the customers' requirements, predict, forecast identify opportunities, and have access to large amounts of data. BI is an attractive system also through the applicability that it has among the daily tasks. Other areas where BI is increasingly used are social media, marketing, finances, telecommunications and many other fields which are dependable of BI tools and applications.

The choice of BI approach as study topic for the thesis encountered limitations. The subject of the research is very broad and therefore the thesis follows the frame which covers the proposed objective of the work and responds successfully to the research questions. Another encountered limitation was that BI applications are expensive to implement and therefore it constrained the output of this work to be theoretical except for a number of the applications which were tested thanks to the trial version made available on the internet in order to analyze them in detail. For the organizations the limitations can consist in the cost. BI systems are expensive to implement even if the investment is recovered. BI approach is complex and therefore its users must firstly learn how to use it in order avoid confusions. Most of the small and medium-size organizations are reticent to choose BI systems for their business because the implementation can lasts around eighteen months. (Compare Infobase Limited 2012).

Despite of the encountered limitations, the proposed research topic is clearly analyzed and provides answers to the research questions. Along with the advantages discussed above, BI concept guarantees that organizations which choose to trust this system gain increased performance, improve decision making process, reduce research time and make efficient business. Future research may consist in deepening the knowledge regarding other applications of BI and development of BI systems.

To conclude my thesis, I consider that the research topic is relevant today and helped me to understand the role of BI in the business environment and how efficiently users can utilize BI applications to lead to improved performance.

REFERENCES

Printed

Howson, Cindi 2008. Successful Business Intelligence, Secrets of Making BI a Killer App. McGraw-Hill, New York, USA.

Pareek, Deepak 2006. Business Intelligence for Telecommunications. Auerbach Publications, Boca Raton, FL, USA.

Parr, Olivia 2009. Business intelligence success factors: tools for aligning your business in the global economy. John Wiley & Sons, Hoboken, New Jersey, USA.

Sabherwal & Becerra-Fernandez 2009. Business intelligence: Practices, Technologies, and Management. John Wiley & Sons, Inc, USA.

Williams, Steve & Williams, Nancy 2006. Profit Impact of Business Intelligence. Morgan Kaufmann, Burlington, MA, USA.

Turban, Efraim & Sharda, Ramesh & Delen, Dursun 2011. Decision Support and Business Intelligence Systems. Pearson Education, New Jersey, USA.

Not printed

BARC GmbH 2011. Business Application Research Center. BARC GmbH, Steinbachtal, Wurzburg Germany.

Biere, Mike 2010. The New Era of Enterprise Business Intelligence: Using Analytics to Achieve a Global Competitive Advantage. IBM Press, Boston, MA.

BusinessIntelligence 2012. Do you need Business Intelligence? Read 17.04.2012 < http://businessintelligence.com/do-you-need-business-intelligence/>

Business Intelligence Software Comparison 2012. Compare Business Intelligence Vendors. Read 18.04.2012 < http://www.comparebi.com/compare-vendors/>

Charam, Ram 2004. Profitable Growth Is Everyone's Business: 10 Tools You Can Use Monday Morning. Crown Publishing Group, Westminster, MD, USA.

Castellanos, Malu & Dayal, Umeshar & Miller, Renee 2009. Enabling Real-Time Business Intelligence Third International Workshop, BIRTE 2009, Held at the 35th International Conference on Very Large Databases, VLDB 2009, Lyon, France, August 24, 2009, Revised Selected Papers. Springer, Berlin/Heidelberg, DEU.

Ericsson, Rob 2004. Building Business Intelligence Applications with .NET. Charles River Media, Herndon, VA, USA.

GoliInfo 2012. BusinessObjects Vs Cognos. Read 18.04.2012 <http://www.bi-dw.info/businessobjects-vs-cognos.htm>

Hiltbrand, Troy 2010. Social Intelligence: The Next Generation of Business Intelligence. Business Intelligence Journal VOL. 15, NO.3, 7-13.

IBM Redbooks 2002. DB2 UDB's High-Function Business Intelligence in e-business. IBM, Durham, NC, USA

IBM Redbooks 2005a. SAP Solutions on IBM DB2 UDB V8.2.2 Handbook. IBM, Durham, NC, USA.

IBM Reedbooks 2005b. Tivoli Data Warehouse Version 1.3: Planning and Implementation. IBM, Durham, NC, USA.

IBM Reedbooks 2005c. Business Performance Management . . . Meets Business Intelligence. IBM, Durham, NC, USA.

IBM 2009. Evaluate: IBM Cognos Business Intelligence. Read 19.4.2012< http://www.ibm.com/developerworks/downloads/im/cognosbi/index.html>

IBM 2011. Cognos 8 Business Intelligence Analysis for Microsoft Excel. Read 19.4.2012 <http://www-01.ibm.com/software/analytics/cognos-8businessintelligence/analysis-ms.html>

IBM 2011. IBM Cognos Analysis Software. Read 19.4.2012 <http://www-01.ibm.com/software/data/cognos/products/analysis-software.html>

Knight, Brian & Jorgensen Devin 2010. Knight's Microsoft Business Intelligence 24-Hour Trainer. Wrox, Hoboken, NJ, USA.

MicroStrategy 2012. Microstrategy Intelligence Server. Read 18.4.2012 <http://www.microstrategy.com/Software/Products/Intelligence_Server/index.asp>

Microstrategy 2012. MicroStrategy MultiSource Option. Read 18.4.2012 <http://www.microstrategy.com/Software/Products/Service_Modules/Multisource/faqs.as>

Microstrategy 2012. MicroStrategy Distribution Services. Read 18.4 2012. <http://www.microstrategy.com/Software/Products/Service_Modules/Distribution_Services/index.asp>

Moss, Larissa & Atre, Shaku 2003. Business Intelligence Roadmap: The Complete Project Lifecycle for Decision-Support Applications. Addison Wesley, Boston, MA, USA.

Oracle 2010. Oracle Business Intelligence Enterprise Edition 11g. Read 19.4.2012 <http://www.oracle.com/us/solutions/ent-performance-bi/enterprise-edition-066546.html>

Paladino, Bob 2010. Innovative Corporate Performance Management : Five Key Principles to Accelerate Results. Wiley, Hoboken, NJ, USA.

Panneerselvam, R. 2004. Research Methodology. Prentice-Hall of India Private Limited, New Delhi.

Poirer, Charles.C & Walker, Ian 2005. Business Process Management Applied : Creating the Value Managed Enterprise. J. Ross Publishing, Incorporated, Boca Raton, FL, USA.

Prescott, John E. & Miller, Stephen H. 2001. Proven Strategies in Competitive Intelligence : Lessons from the Trenches. Wiley, NY, USA.

Riaz, Edwards & Babaran 2009. IBM Cognos 8 Planning. Packt Publishing Ltd, Olton Birmingham, GBR.

Rittman Mead Consulting 2010. Installing OBIEE 10.1.3.2.1 on Ubuntu Part II. Read 19.4.2012

<http://www.rittmanmead.com/2007/05/installing-obiee-101321-on-ubuntu-part-ii/>

SAS Institute 2010. SAS® Business Intelligence Providing better answers, faster. Read 21.04.2012 < http://www.sas.com/technologies/bi/index.html>

SAS Institute 2011. SAS® Enterprise BI Server A Fast, Flexible Business Intelligence Solution. Read 21.04.2012 < http://www.sas.com/technologies/bi/entbiserver/index.html>

SAP 2012. Four Decades Later, SAP Continues to Help the World Run Better and Improve People's Lives. Read 20.4.2012 < http://www.sap.com/corporate-en/press/newsroom/press.epx?pressID=18584>

Sehgal, Vivek 2011. Supply Chain as Strategic Asset : The Key to Reaching Business Goals. Wiley, Hoboken, NJ, USA.

Siddiqui, Muneeb A. 2010. Oracle E-Business Suite R12 Supply Chain Management: Drive Your Supply Chain Processes with Oracle E-Business R12 Supply Chain

Management to Achieve Measurable Business Gains. Packt Publishing Ltd, Olton Birmingham, GBR.

Thierauf, Rober J. 2001. Effective Business Intelligence Systems. Greenwood Press, Westport, CT, USA.

Verweire, K. van den Berghe, L.2004. Integrated Performance Management : A Guide to Strategy Implementation. SAGE Publications Inc. (US), London, GBR.

Waltz, Eduard 2003. Knowledge Management for the Intelligence Enterprise. Artech House, Norwood, MA, USA.

Wolfgang, Niefert 2009. SAP Business ONE Implementation. Packt Publishing Ltd, Olton Birmingham, GBR.

Yuli , Vailiev 2010. Oracle Business Intelligence: The Condensed Guide to Analysis and Reporting. Packt Publishing Ltd, Olton Birmingham, GBR.