Usage of Business Intelligence technology in Croatia: Preliminary research

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Abstract: - Each company aims to improve its business performance. Business Intelligence (BI) helps firms to optimize their management capabilities. Usage of Bi system leads to conditions, procedures and mechanisms for creating quality data, information and business knowledge. By these the companies can efficiently respond to numerous pressures in complex environment. The main objective of the paper is to present the short overview of business intelligence technologies, and show the results of the research about the use of business intelligence technologies as management support system in Croatian companies.

Key-Words: - Business Intelligence, Data Warehouse, OLAP, Data Mining, research in Croatia

1 Introduction

Companies have always striven for a better access to data and information for a better understanding of business operation and successful management.

One of the reasons for letting BI user needs unsatisfied is that the development of Bi system in many organizations is characterized by the disintegration and poor data quality despite significant expenditures for new information technologies, as well as insufficient involvement of users and management support.

In the new generation of management support system, the information resources are unified from a business perspective and dispersed from a physical and technological perspective. The need for unified resource of information and knowledge for business management led to the data warehouse. Quality data and information alone are not sufficient; one of the distinguishing assets of successful companies is knowledge. Usage of techniques and tools for extracting useful knowledge from the available data,

knowledge discovery technology, is necessary for a company.

At the current stage of the knowledge discovery techniques, there are two widely used enabling techniques [10]: online analytical processing (OLAP) and data mining.

The data warehouse, OLAP and data mining are the most used business intelligence technologies. Often, people refer to data warehouse and business intelligence synonymously.

This paper is structured as follows. First, the study objectives are introduced. Next, the overview of the most important BI technology is presented in section 2. The section 3 shows the methodology and results of the research of usage BI technology in Croatian companies. Finally, the last section outlines the conclusions and discusses some directions for further research.

2 Business Intelligence

Many various definitions of the Business intelligence exist in literature. We can define BI as a system comprised of both technical and organizational elements that presents its users with historical information and analysis to enable effective decision making and management support, with overall purpose of increasing organizational performance [11]. The business intelligence technology has been rapidly expanded and improved and more and more complex business questions can be answered using these technologies: from the user friendly querying tools to the OLAP and data mining tools.

Business intelligence technology include: data warehousing, on line analytical processing (OLAP), extraction, transformation and loading (ETL) data, data cleansing, information portals, data mining, business modelling, etc. This paper is focused in the most widely used business intelligence technologies: data warehousing, OLAP, and data mining. These terms are described further.

2.1 Data Warehouse

Data warehouse [3,4,7] is an integrated, historical collection of detailed and summarized data that is fed by the spider web environment and external data sources. It is organized by business areas (subject oriented) and is user-friendly, especially for manager and user who is usually a business analyst.

Internal and external sources of data may be used to fill the data to the data warehouse. The share of external data is greater for higher levels of management.

Management support systems that are used by managers at different management levels are usually based and built upon data warehouses. The data in the data warehouse is extracted, transformed (according to the requirements of DW model), detailed, aggregated and improved in order to support analysis and decision process. This is the way to make data in the data ware house consistent (i.e. one version of the truth"), which enables easier and more efficient access and use of corporate data on all management levels.

The main benefits of data warehouses are:

- better business intelligence,
- reduced time to locate, access and analyzing data/information,
- consolidation of disparate information sources (data integration).

Since much effort and high investments are required to build and maintain a data warehouse it is necessary to undertake a careful feasibility study.

2.2 OLAP and Data Mining

On-line analytical processing (OLAP) tool is the combination of analytical processing procedures and graphical presentation (user interface). OLAP tools provide users with the ability to explore and analyse large amounts of data, their relationships, and present data in different perspectives (data visualization), involve complex computations, etc.

The key features of an OLAP application are [2]:

- multidimensional views of data,
- calculation intensive capabilities and
- time intelligence.

A multidimensional view of data that is usually used in OLAP applications provides quick and flexible access to data and information. Typical applications performed on multidimensional data views are [5]: roll-up, drill-down, slice and dice, and pivoting.

With OLAP application, more complex analyses are possible, such as time series, charting,

forecasting, modelling, statistical analysis, "what-if" functionality and scenario analyse. Analytical processing procedures represent methods of detecting information and knowledge needed in the business management.

OLAP technology potentially provides several benefits to an organization [2]:

- increases the productivity of business managers, analysts, and whole organization by inherent flexibility and timely access to strategic information,
- enables developers to deliver solutions to business users faster, as well as to provide better services,
- provides the ability to model real business problems and respond more quickly to market demands.

Data mining, by its simplest definition, automates detection of key patterns in a database. Data mining is the exploration and analysis, by automatic or semiautomatic means, of large quantities of data in order to discover meaningful patterns and rules [1].

Gartner Group defined data mining as the process of discovering meaningful new correlations, patterns, and trends by sifting through large amounts of data stored in repositories, using recognition technologies as well as statistical and mathematical techniques [9].

Since OLAP is retrospective in nature [10] and a user should understand how to navigate the data, data mining provides prospective knowledge discovery. It automatically discovers hidden trends and patterns in large volumes of data. A significant distinction between data mining and other analytical tools is in the approach used in exploring the relationships among the data.

Data mining includes: association, classification, estimation, prediction, affinity grouping, clustering, description and knowledge discovery.

There are several techniques and algorithms used in data mining tools (Figure 2), from statistic analysis, through rule induction and nearest neighbor algorithms, to neural networks and genetic algorithms [6].

Data mining enables users to discover knowledge and provides them with greater depth and understanding of data than ad hoc querying and using of OLAP applications.

3 Business intelligence in Croatia

3.1 The methodology of the research

Data for the research was collected using a survey based on the questionnaire. The research included the questions about three areas: general information about the organization, information about transactional (operational) information system (ERP) and business intelligence technology as support management support system. In this paper the main results of the last part are presented.

The research of the usage of business intelligence technology was related to adoption of the data warehouse, on-line analytical processing and data mining technology. It also analysed initiators, objectives and effectiveness of the business intelligence system, usage of BI at different management level, and key tools used in BI project development.

The questionnaires were distributed to 105 Croatian companies randomly selected from the list of "400 biggest" companies in Croatia [8] in the period from May 1 - September 30, 2013. The selection of the companies was based on their revenues. The size of the selected companies was analyzed according to the revenue and the number of employees in 2012.

The CEOs and IS executives were asked to answer the questionnaire, in order to ensure that the responses reflect the organizations' perspective of the business intelligence.

During the preliminary research 11 questionnaires were returned (which accounts for 10 percent response rate). In the future, the questionnaire will be uploaded to a Web server in order to continue the research.

3.2. The results of the research

Results of the research showed that the all (100 %) of the respondents are familiar with the data warehouse (DW) and OLAP and 80% with the data mining as the most widely used business intelligence technologies.

Even 82% of the respondents use data warehouse. More than 90% of the companies worldwide are currently using and/or developing data warehouse applications. The percentage of the DWs, which are used is lower in Croatian companies (82%), but is still satisfactory.

Probably the reasons for organisation without the data warehouse are the lack of knowledge about the data warehouse efficiency in supporting business management.

Table 1 shows the initiators of the data warehouse project. In most cases, initiative came from the management, but only in 3% of cases from the general manager. In 45% of cases, such an initiative came from the IS department. This results show that management, finally, is truly aware of the importance of data warehouse and benefits of business intelligence system as effective management support.

Table 1 Initiators of Data Warehouse project

Initiators	Percentage
General manager	3%
Top management	36%
Line management	55%
IS department	45%
Other	4%

The organizations that have and use the data warehouse, indicated that the main reasons for implementing the data warehouse were the reduction of time needed to find, access and analyze data (100%) and data integration (91%).

Analysis of the data warehouse development tools presents a large variety of used tools; however, Oracle, IBM and Microsoft solutions were used in most organizations.

The respondents (companies who have data warehouse) where asked about the use of OLAP and data mining technologies/tools. The results are presented in Figure 1. As evident from Figure 1, OLAP tools are in use in 73 % companies and data mining technologies are only use in 10% firms.

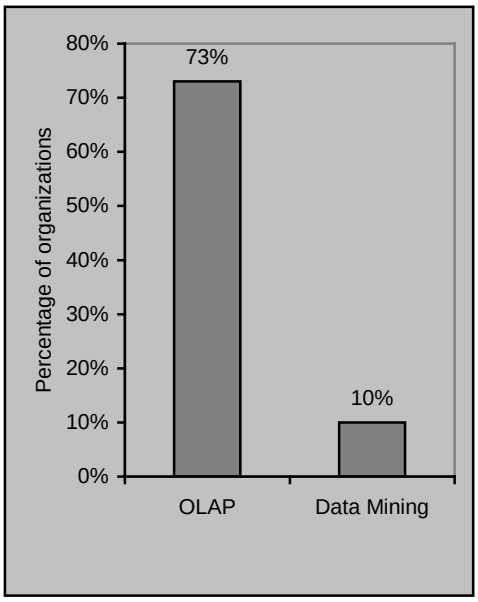

Figure 1 Usage of OLAP and data mining tools

It was expected that the level of OLAP tools usage is somewhat similar to the state of the data warehousing, as these two technologies are complementary [2]. Some organizations do not use OLAP tools, mostly because they don't have appropriate data sources, or because the management doesn't support it.

The data mining tools and techniques are not widely used in Croatian organizations. Probably the reasons for this are that tools are expensive and not easy to use and companies are small or medium size.

The respondents are not informed about the development of information technology in the data mining area, since almost 18% of them do not know what data mining is.

Table 2 shows the proponents of using OLAP/DM technology/tools. As evident, the OLAP/DM initiative, in most cases, came from the IS department. But, in 20% and 37% of cases, such an initiative came from the top and line management. It was expected that the initiative never came from the general manager.

This result shows that (finally) management understood and accept the importance of easy and fast access to information and knowledge by using BI technologies.

Table 2 Proponents of using OLAP/DM

Proponents	Percentage
General manager	-
Top management	27%
Line management	55%
IS department	63%
Other	4%

In the rest of this chapter, results about the implementation of management support system based on BI technologies are presented.

Participants in the business intelligence project are shown in Table 3.

Table 3 Participants in the BI project

Participants	Percentage
Top management	27%
Line management	55%
IS department	63%
Consultants	45%

The respondents were asked which management level (e.g. operational, tactical and/or strategic level) uses the data/information provided by the management support system based on BI technology. The results are presented in Figure 2.

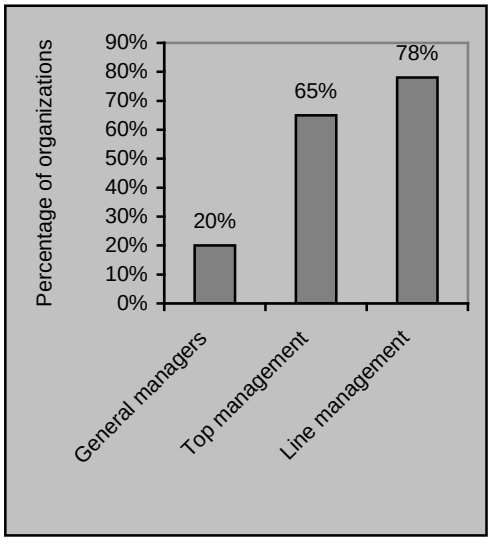

Figure 2 Usage of management support system (BI) at different management levels

Respondents were asked about the effectiveness of the management support system based on BI system. Al respondents rated their BI effective.The most of them estimated (73%) that their BI is good and 27% of them as very good. Results are shown in Table 4.

Table 4 Effectiveness of management support system based on BI

Management support system effectiveness	Percentage
Insufficient	-
Sufficient	-
Good	73%
Very good	27%
Excellent	-

4 Conclusion

Business intelligence plays a key role in helping companies optimize their decision-making process and management and achieving competitive advantage.

Quality (correct and prompt) information becomes an important resource for efficacious decision-making and management. Only management support system based on the modern information technology, which is the data warehouse concept, can provide data and information needed for management of business processes. The data warehouses are used, or being developed, in more the 90% of the worldwide companies.

However, quality data and information alone are not sufficient. Usage of technologies for extracting useful knowledge from the data warehouse is necessary for a company. There are two widely used enabling techniques of the knowledge discovery: online analytical processing (OLAP) and data mining. In the companies worldwide, level of the OLAP tools usage is somewhat similar to the rate of the data warehouse (90%).

The research in Croatia included tree business intelligence technologies: data warehouse, OLAP tools and data mining. Results of the research

showed that many organizations are aware of the meaning of business intelligence (all, 100% of the respondents are familiar with the term data warehouse). Approximately 82% of Croatian companies are currently using data warehouse applications. Taking into consideration that Croatia is still less developed country and one of the countries in transition, the state of the data warehouse technologies is satisfactory.

OLAP tools are in use in 73 % organizations (somewhat similar to the data warehouse). This result is expected. The data warehouse and OLAP tools are two complementary technologies, so it could be expected that the level of the OLAP tools usage is somewhat similar to the state of the data warehousing. Data mining tools and techniques are in use in only a few organizations, while even 18% of IS executives don't know what data mining technologies are.

The question is, have the managers, finally, realized the importance of quality information for making business decisions and successfully management? Results show that managers are often among the initiators of data warehousing projects. Satisfaction with the management support system based on business intelligence technologies is high (good and very good) and it is much higher, if the initiator and participant of the business intelligence project was a manager. This was expected, because manager support and user involvement play a key role in the success of an IT project, especially in business intelligence project.

We plan to carry out the research next year and compare the results. We would also like to include other Central European companies in our investigations.

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