APPLICATION OF BUSINESS INTELLIGENCE SYSTEM IN COMPANY RESTRUCTURING PROCESS: THE CASE OF CROATIA

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ABSTRACT

After Croatian accession to the EU, Croatian companies have faced tough competition and all other challenges posed by doing business in open markets. These companies must increase competitiveness and take their position on developed globalized markets through differentiation of their products and services and/or creation of cost advantage. For many companies in Croatia this necessitates restructuring of the firm through which a comparative advantage can be achieved. This paper describes the restructuring process and actions which are taken during the restructuring, the goal of which is to increase efficiency and achieve intelligent management of the company. During restructuring process, it is important to apply both qualitative and quantitative approach in business analysis in order to detect key weaknesses and problems. The main tool in business analysis, which is the foundation of making business decisions during restructuring process, is the business intelligence system. Business intelligence systems enable companies to obtain wide-ranging information about factors which influence the business. The presented case study demonstrates specific examples of utilization of business intelligence systems during the restructuring process, synergy of business intelligence, strategy and business processes and improvements achieved through implementation of certain measures during the restructuring process.

1. INTRODUCTION

The increasing intensity of competition in global markets and the global economic crisis had a negative impact on the profitability of Croatian companies in recent years. There are several reasons, but one of the most important ones is that Croatian products are on the lower level of competitiveness in terms of price and quality compared to products on the international markets. It is therefore of great importance to restructure Croatian companies, ensuring increased competitiveness and business efficiency.

These conditions require management to conduct company restructuring in order to achieve efficiency and every aspect of success. Usage of BI technology and development of business intelligence system have an important role in achieving maximal effects of the company restructuring.

This paper is structured as follows. Following an introduction, in Section II, the Business Intelligence is shortly presented, brief overview and advantage of company restructuring is displayed in Section III, examples of BI system application in the restructuring process is shown in Section IV. Finally, in Section V, the main conclusions are drawn.

2. BUSINESS INTELLIGENCE

Business Intelligence is a set of tools and methods that helps the company to collect internal and external data, converts them to information and based on information creates knowledge. According to Peter Drucker (Drucker, 2003), knowledge has become a key economic resource that is by relevance ahead of the three traditional business resources (labor, capital and land).

Main components of business intelligence as shown in Figure 1 are (Liautaud and Hammond, 2001):
- Data Warehouse,
- ETL process (Extract, Transform and Load),
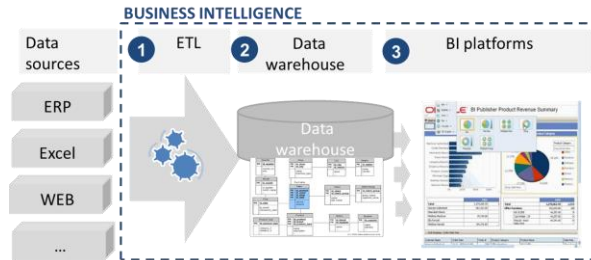- Business intelligence platforms.

Figure 1. Main components of BI

Each of these components will be further developed below.

2.1 Data Warehouse

Data warehouse is a repository designed to accept data collected from transaction systems, operational data stores, and external sources. Data Warehouse then connects this information in the aggregate, summary form acceptable for analyzing and reporting based on pre-defined business needs (Gartner, 2015). Operational database disables the integration and analysis of data from various modules that significantly complicates the understanding of the entire business and at least a certain part of the process. Due to the limited space in the operational database, it does not contain historical data so it is impossible to conduct an analysis of trends and performance over a longer period of time.

The data warehouse allows us to get integrated data in a short period of time from which we can monitor trends and predict future events. "Decision support system based on the data warehouse concept ensures timely access to quality information as a basis for decision making"(Ćurko, 2001).

A data warehouse is the data base where business data is collected and stored, but also represents a source for information that will later be processed and used in business intelligence reports. The data warehouse should be designed in a way that easily adapts to changes in business, must have the ability to accept new data and changes in the hierarchy and relations among the data. It should include data from all functional parts of the company to meet the information needs of users on the strategic and operational levels. Apart from internal sources, data warehouse can collect structured and unstructured data and information from external sources.

2.2 ETL

The set of processes that are in professional community called ETL process aim to extract, transform and load data from one or more operational databases into the data warehouse (Panian, 2007). ETL starts with the preparations that include conversion, synchronization and data cleansing (Panian and Klepac, 2003). The extraction phase aims to convert the data collected from different sources into a single format appropriate for data transformation. Data conversion is needed to unify the data that will be used in later phase. Synchronization is important in order to avoid data inconsistency when the same attribute in data warehouse has different values. Data cleansing is the process of detecting and deleting corrupt or inaccurate records from a database that could have occurred during testing and simulation.

2.3 Business Intelligence Platforms

Business intelligence platforms are tools that help end users, through processing data, to analyze business, to find out what happened in the past, why a particular business event appeared, to see what is currently happening and to try to predict future events. Figure 2 (Wayne and Eckerson, 2007) presents the tools that are appropriate for each individual need and will be described below.
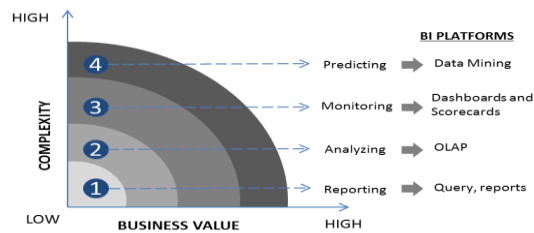
Figure 2. BI platforms (Wayne and Eckerson 2007)

Business Intelligence Reports are predefined reports and ad hoc queries that give the information about events that already occurred.

OLAP is a group of tools for creating information and knowledge out of data and is an acronym for On-Line Analytical Processing. "OLAP is a conceptual and intuitive model based on a multidimensional analysis method, which implies that data can be simultaneously looked at through a larger number of filters, which in technical terms are called dimensions" (Panian, 2007). OLAP involves very robust computing capabilities needed to meet the specific calculation requirements of the multidimensional structure. OLAP tools rely on warehouse or data mart from where they gather information and allow a user to perform rapid analyses that enable managers to ask questions and get answers in a very short time.

Dashboard is a visual display of the most important information needed to achieve one or more objectives that have been consolidated on a single computer screen so it can be monitored at a glance (Few, 2006).

And finally, BI platforms include the data mining capability. "Data mining is the search for valuable information in large volumes of data. Data mining is the exploration and analysis, by automatic or semi-automatic means, of large quantities of data in order to discover the meaningful patterns or rules"(Pejić Bach et al, 2007). Data mining can be interpreted as finding of relationships between variables in large amounts of data in order to discover some behavior patterns that were unrecognized before and to more accurately predict future trends, enabling us to make business decisions based on knowledge.

3. COMPANY RESTRUCTURING

According to data published by the Croatian Bureau of Statistics[1], there was a significant drop in activity of industrial enterprises in Croatia in the last few years. Significant decline in GDP and industrial production was for the first time recorded in 2009. The effects of the global financial crisis which started in 2008, have spilled over into the real sector, and in 2009 the gross domestic products of all economic superpowers such as United States, Japan and the European Union have declined. Although the global economic recovery started already in 2010, Croatian economy has continued to decline until 2015, which has negatively affected Croatian companies that were traditionally more focused on domestic market. To compensate the income loss in Croatia, they had to focus on foreign markets. In addition to the crisis, Croatian accession to the EU had an additional impact on the Croatian industry, which meant that companies had to make greater effort to gain and maintain competitiveness.

In such tough economic environment many companies have had to implement some kind of restructuring, which should help them achieve optimization of operations and cost reduction, thereby ensuring international competitiveness.

3.1 Financial Restructuring

Companies in distress in most cases are facing liquidity and insolvency problems. In order to improve the financial situation of an enterprise, companies go through financial restructuring process. The most important measures which are normally included in restructuring plan are (Pomerleano and Shaw, 2005): debt to equity swap, capital increase, debt write-off, extension of loan maturity and reduction of interest rates.

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[1] http://www.dzs.hr/basic indicators

In September 2012, Croatian Government has adopted Pre-bankruptcy settlement procedure as a legal framework for carrying out the financial restructuring process. The implementation of the financial restructuring has a short-term goal of improving financial stability of the company. However, in order to achieve long-term stability and remove the causes that led to the crisis it is important to carry out operational restructuring too.

3.2 Operational Restructuring

The process of operational restructuring starts with a very detailed analysis of existing conditions and benchmarking. The objective of operational restructuring is a fundamental change in the cost structure in order to achieve the greatest value to the customer at the lowest cost (Zilka, 2010).

More often than not, management becomes aware of the need for the restructuring after significant decline in profitability and liquidity problems. Most companies at this stage are in a state of "unconscious incompetence", they are unaware what they are doing wrong, but to get to the stage of "conscious incompetence" and discover the causes of reduced profitability, we need business intelligence.

Figure 3 (Zilka, 2010) shows the fundamental framework of the operational restructuring. The foundation elements of the restructuring process are: analytics and benchmarking; change management and communication; and governance and knowledge management.

At the core of the model are data, analytics, and benchmarking. The best way to find out which parts of the process are inefficient and non-optimized is to compare parts of business processes and performance metrics to industry leaders and best practices from other companies.
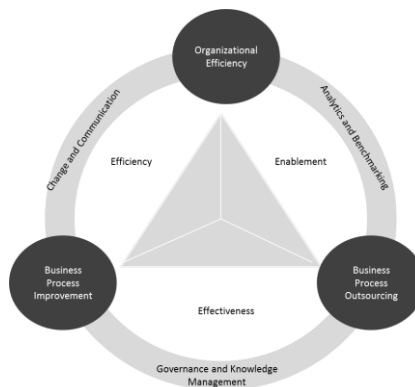

Figure 3. Holistic Framework (Zilka, 2010)

Application of these methods can help detect business segments that are performing well and other segments that have to be improved.

The restructuring process implies the implementation of changes in business. It is important to communicate the changes with employees and explain the reasons for the implementation so they can except and execute changes.

The project team involved in the restructuring process must include highly qualified employees from all segments of the company. The project team, through the process of restructuring, is building a knowledge management system, which increases the level of knowledge in the company and is supplying employees with the information relevant to the business. Members of the project team, after the changes are implemented, train employees on how to utilize the new and improved processes, tools, and technology in order to successfully implement changes.

The framework consists of three separate and distinct work streams: organizational efficiency, business process improvement and business process outsourcing.

The goal of reorganization is to modify the current structure in order to meet its objectives more effectively, while transformation includes fundamental change in the structure itself and in the organizational culture of the company (Sikavica and Novak, 1999).

A process can be viewed as a set of activities performed utilizing human resources, technology and information to get to the final product. Business process improvement (BPI) is a set of disciplines and tools

applied by managers to improve company performance (Improving Business Processes, 2010; Khan, R. N., 2004). BPI focuses on introducing drastic and fundamental changes to business processes with the aim of increasing efficiency. Companies and managers usually use process maps to define all the process activities and the process workflow. Companies with developed business intelligence systems regularly monitor the performance of each process, as well as measure the success and the level of input and output of different process segments. In defining a process map, each process step is explained in detail, including a description, number of repetitions, responsible person and time required for completion. In this phase, a proposal for process redesign, which would ensure quality output and fulfillment of customer expectations at the lowest possible cost and within the shortest possible period of time is prepared. Through process redesign, the number of duplicate tasks, causing unnecessary utilization of resources, is reduced. Process steps that are independent from others are outsourced, and certain activities are proposed to be performed simultaneously in order to reduce time required for process completion. The ultimate goal is to establish a system for monitoring business process steps using business intelligence systems to enable simple monitoring and bottleneck detection in the future.

Outsourcing of business processes or activities (Bahtijarević Šiber and Sikavica, 2001) is an organization's decision to stop an activity that is more successfully performed by the competition, which is usually connected with the organization through a network. Organizations thus focus on their main activities and outsource the activities which they perform less successfully than the competition. The decision to outsource an activity relies mainly on the fact that external sources (sources operating outside the organization) perform particular activities more efficiently and at a lower cost compared to the organization. The decision to apply outsourcing as a business strategy must be preceded by a thorough analysis of the organization's condition, taking into consideration all its structural elements. A detailed analysis of the costs of each process considered for outsourcing is performed. The results are then compared to the costs that would be incurred through outsourcing.

Goals that need to be achieved through the process of operational restructuring: a) efficiency, b) effectiveness, and c) enablement. Through restructuring process, we want to enable company to do the right things in efficient way.

4. EXAMPLES OF BI SYSTEM APLICATION IN THE RESTRUCTURING PROCESS

The company which constitutes the subject matter of the case study initially had a partially developed business intelligence system, which was upgraded in the restructuring process to suit the company's business needs. An important segment of any business intelligence system is a profitability monitoring system. Depending on the activities that it performs, a company's profitability can be analyzed taking into consideration the three main business segments, i.e. production, engineering and logistics.

4.1 Production

The goal of any company is to allocate as many costs as possible to product units in order to determine which types of products or services are most profitable, i.e. which products or services contribute most to the coverage of costs and should be focused on in order to achieve the highest possible earnings. It is sometimes extremely difficult to do so as some of the costs may not be allocated to a particular product or are allocated based on the estimated utilization of particular resources (e.g. depreciation of machinery, power, and similar). The more precise the cost allocation, the more realistic the view of the company's business operations, e.g. the average profitability by product, market, and similar. Business intelligence systems are the most important tools for deriving such information. Since the analyzed company used data from two different sources in its Production Business Unit, i.e. a production process information system developed for company purposes and a warehousing and sales module built into the transaction system purchased and adjusted to the company's business needs, application of a business intelligence system proved necessary to integrate such data. Prior to integration of production and sales data into a data warehouse, it was quite difficult to monitor the actual profitability since one source included data on utilization of raw material, hours of work, power, etc., while the other included data on realized revenues by product category, and the data were not unified.

Profitability used to be monitored by taking into consideration the calculative price (estimated) and not the actually booked costs per work order. This was quite misleading in cases where calculative prices were significantly different from the realized costs. Figure 4 presents the process of integrating sources and data, which enables profitability monitoring by product and customer.
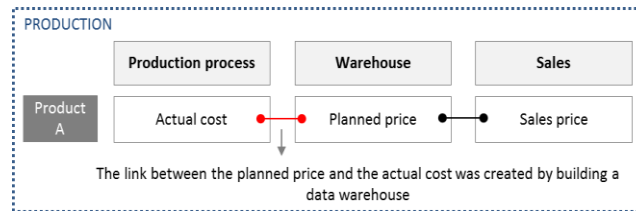

Figure 4. Connecting data in Production module

This monitoring method is significant as it allows comparison of prices with the competition as well as determination of margins achieved by particular product category. In case the margins fall below average, the company can identify the categories and production processes that are less profitable and start implementing measures to improve and reengineer certain business processes in its Production Business Unit.

4.2 Logistic

In the analyzed company, logistics used to be merely a support activity performed within the Construction and Production Business Units. The largest part of logistic activities referred to transportation of goods and use of specialized vehicles as tools for on-site construction works. The existing transaction system provided very little information on performance of the Transportation Business Unit, which made any analysis impossible. The services were billed applying the prices based on estimated costs per vehicle category, but the comparison of revenues and actual expenses was possible only at the aggregate level of revenues and expenses of the Transportation Business Unit. The company's business intelligence system was later upgraded to include the possibility of collecting the following additional information for each vehicle, thus enabling analysis of company performance and comparison of prices with the competition: start and end point of each trip, realized mileage per trip, quantity of freight which is being transported and vehicle utilization in days per year.

The costs are allocated at the level of particular vehicles. After collecting the above mentioned data, it is possible to make analyses and obtain answers to the following questions:

- To what extent is a particular vehicle utilized during a period of one year (in days and kilometers)?
- What is the average weight of the freight being transported?
- What is the share of fixed costs in the total costs per vehicle?

The analysis showed that the vehicles used to transport goods were insufficiently utilized and that the average realized mileage per year was very low, which is why the share of fixed costs (depreciation of vehicles, cost of maintenance, driver salaries, etc.) was high in terms of unit prices. An additional disadvantage determined through the analysis is the fact that the vehicles usually return empty and the return trip is therefore not charged for. This is due to the fact that the company is not registered for performing transportation services. It transports goods for own purposes only, which makes it very difficult to fill the capacities during the return trip. Service providers specialized in transportation usually manage to fill the capacities and record a smaller share of unutilized trips due to a large number of customers. The analysis results show that multiple financial benefits would be achieved if the company outsourced transportation services, and considering that transportation services do not constitute part of the company's main activity and that there are numerous external providers of such services, the company's operations would not be jeopardized through transportation outsourcing.

4.3 Engineering

The Engineering Business Unit is responsible for construction works and the related activities, such as contracting of projects, monitoring of project realization, supply of goods, coordination of logistic services, coordination of employee activities, etc. The data required to monitor the projects and activities of the

Engineering Business Unit were stored in different sources. It was necessary to integrate the data and create new databases which would include other information concerning the company's business operations that were not previously monitored. Further in the text is a list of data relevant for monitoring and planning the activities of the Engineering Business Unit (also indicating the relevant source):

Project Realization (Accounting / source – Oracle E-Business Suit): detailed presentation of realized revenues and expenses, claims, liabilities, collected amounts, realized hours of work, etc.;

Project plan (Project Management / source – a template in Excel for each particular project from which the data are automatically transferred to the data warehouse): planned future monthly revenues and expenses, planned project cash flow, planned utilization of human resources, required bank guarantees, etc.;

Bank guarantees (Finance / source – a template in Excel for each particular project from which the data are automatically transferred to the data warehouse): data on the total and utilized guarantee amount, maturity by bank guarantee and name of project that it refers to;

Future projects (Contracting / source – a template in Excel for each particular project from which the data are automatically transferred to the data warehouse): list of all future projects/tenders the company could apply for and, as a result, potentially contract new jobs, including the data concerning the approximate margin, required guarantees, required human resources, etc.

Integration of realized and planned data on existing projects allows us to compare the margin realized up to the current project stage, the target margin, as well as to estimate the company's financial results and cash flow. Cash flow estimation is one of the most important financial statements. Where there are a few dozen or hundred projects the realization of which and the related plan can change often during the year, we need a tool for collecting and aggregating such data, as well as for integrating them with other data relevant for cash flow estimation (existing monies due to suppliers, liabilities under loans, etc.).

Considering that it is very significant for the analyzed company to manage its limited resources (human resources, guarantee amount, equipment, etc.) efficiently, answers to the following questions must be obtained in order to maximize profit:

- To what extent is the total guarantee amount utilized currently and when is the release of the guarantee limit expected so that new contracts could be contracted?
- What share of human resources is being utilized on current projects and what is the expected future utilization of human resources on currently contracted projects?
- What kind of projects are expected in the future?
- What are the estimated earnings that could be achieved on future projects and markets?
- If we take into consideration the limited total guarantee amount and the limited human resources, how many new projects could be contracted and in which markets in order to maximize profit and simultaneously ensure optimum capacity utilization?

By integrating data from different sources, as described above, we get a clearer insight into the company's business operations, recognize its strengths, identify its weaknesses and start implementing appropriate standard restructuring activities in order to implement improvements and eliminate the causes that put the company in a crisis.

5. CONCLUSION

BI systems and data warehousing capabilities allow collection of all data relevant for business operations and a quick and easy access to data turn in to information required for analysis. All companies analyze particular standard financial data for business performance monitoring purposes. It is however important to recognize the specifics applicable to a particular company which are relevant for its management process. This is very important in determining the design and architecture of the business intelligence system, which is why communication between top management and departments involved in business intelligence system development, is extremely important.

In this paper we show a profitability monitoring system, as an important segment of upgraded BI system and how can help it in production, logistics and engineering restructuring process.

The goal of any production company is to allocate as many costs as possible to product units in order to determine which types of products are most profitable. Through data integration from production, warehouse and sales, BI system enables profitability monitoring by product and customer and the company can identify

the categories and production processes that are less profitable and start implementing measures to improve and reengineer certain business processes in its Production Business Unit.

The largest and most important part of logistic is Transportation Business Unit. The company's BI system integrated data for each vehicle such as: start and end point of each trip, realized mileage per trip, quantity of freight which is being transported and vehicle utilization in days per year, thus enabling analysis of company performance and comparison of prices with the competition. By using BI system information and analysis show that multiple financial benefits would be achieved if the company outsourced transportation services

The Engineering Business Unit is responsible for construction works. It was necessary to integrate the data from different sources (accounting, finance, etc.) such as: project realization, project plan, bank guarantees and future projects, required to monitor and planning the projects and activities. Integration of realized and planned data on existing projects allows company to compare the margin realized up to the current project stage, the target margin, as well as to estimate the company's financial results and cash flow. Where there are a hundred projects the realization of which and the related plan can change often during the year, company desperately needs a system for collecting, aggregating and analysis such data to manage its limited resources efficiently.

The management asks questions every day. They require answers in order to make business decisions. The role of the team responsible for business intelligence system development is to create data collection and integration platforms (with other data contained in the warehouse), and provide the relevant information for relevant answers in the form of reports.

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