BUSINESS INTELLIGENCE: CONCEPTS AND TOOLS IN ASSESSING BUSINESS FINANCIAL ANALYSIS INDICATORS

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ABSTRACT

The paper deals with the possibilities of recognizing the potential of an enterprise viewed from the aspect of assessing the absorption of financial funds using the concepts and tools of business intelligence (BI). Precisely by using BI tools it is possible to extract information from a large amount of data, discover hidden knowledge from the information crucial for making the right decision. This represents a paper compilation of research results and cooperation of authors, achieved through the student-mentor relationship during the preparation of postgraduate specialist thesis in which goal was to determine – Is it possible to recognize with the help of BI tools the overall potential of the company to apply for EU competitions? In the theoretical part of this paper, the methodological concept of the application of business intelligence in business is presented, the business indicators of financial analysis are processed and their significance explained. In the empirical part, research aimed at the application of BI tools in the identification of indicators of financial analysis of business, which in the beneficiary companies of financial resources positively deviate from the average of their activity, was elaborated. Identification of these indicators achieved by using visualization functionality, while advanced options of BI tools and DAX programming language formulas were used for more complex calculations. The testing of hypotheses and the answer to the research question were obtained by analyzing the set of 1.044 companies. The results of the empirical research confirmed that by using BI tools it is possible to identify financial indicators and establish a correlation between enterprises that are beneficiaries of funds and the quality of the business, which opens the assumptions for the design of the simulation a model that would enable the recognition of the investment capacity of the enterprise and be a kind of decision support system (DSS) for more efficient absorption of financial funds.

Keywords: BI concepts, business intelligence, BI tools, financial indicators, knowledge

1. INTRODUCTION

The adoption of Business Intelligence (BI) systems has become one of the most important technological and organizational innovations in a modern organization that promotes the dissemination of knowledge and is the cornerstone of the business decision-making process. Organizations, both in the public and private sectors, are under extreme pressure to provide top management with relevant business information. In order to achieve this, the business organization needs to have data and information relevant for making strategic, operational and tactical decisions. These data should be processed in accordance with the needs of management accurately, quickly and at the moment that decision makers expect. (Turban et al., 2010) Furthermore, in order to gain a competitive advantage, a business organization and its management must have technological capabilities for collecting and selecting a large amount of data, all with the aim of quick and proper decision-making. (Farjami, 2015) BI has strengthened in recent years, precisely because of the increased need for data collection and the development of digital technologies that have the capacity to store them. Business organizations and their employees have access to large databases and data lakes by using smartphones, internet records, activities on social networks, and with the use of BI tools it is possible to consult them and detect the desired patterns and

trends. (Raisinghani, 2004) In any business organization, regardless of its size, business activities involve the administration of vast amounts of data collected from internal and external sources. All this data using the Bi tool is paired with internal business operations and processes, clients, economic assets and the like and are historically cumulated during the operation of the organization, all with the aim of making operational and strategic decisions of the management of a specific organization. (Mihaelia, Rozalia, 2012) Therefore, BI is often accepted as a framework that collects, changes and presents organized information from various sources, reducing the time required to acquire significant business data and enabling efficiency in the decision-making process of managing the organization. (Den Hamer, 2005) As indicated by Tyson (1986), BI focuses on gathering, processing and presenting information about customers, competitors, partners, products and services. Pirttimäki (2007) explains BI as a process that includes a series of activities, driven by the special needs of decision makers for data with the aim of achieving a competitive advantage, while (Nofal et al., 2013) define BI as an information system that helps decision makers to understand the economic circumstances of the company, and Wixom and Watson (2010, p. 14) view BI primarily through the category of technologies, applications and processes that enable the collection, storage, access and analysis of data that help its users make better decisions. From everything mentioned above, it is clear that BI represents previously hidden knowledge that is revealed from operational, routinely collected business data by applying appropriate computer logical methods, usually supported by information technology. (Panian et al., 2007:1) What companies need to avoid is being data rich and information poor. (Williams, Williams, 2007:1) In their study of the 50 largest Finnish companies, Hannula and Pirttimaki (2003:593) also consider business intelligence as a concept and define it as an organized and systematic process of acquiring, analyzing and distributing information important for business activities. Investigating the success of the concept of business intelligence, Isik (2009: 9-13) concludes that most definitions reflect either a technological or an organizational perspective, although there should be a compromise in this sense. In organizations, special emphasis is placed on management's awareness of the importance of implementing business intelligence and educating all staff with the aim of long-term business improvement, while from the technological aspect, changes happen quickly, and it is necessary to respond quickly to them by following trends in the context of technology and business intelligence tools. (Babić, 2022) To interpret the process approach, many authors cite The Data Warehouse Institute, which explains business intelligence as the process of turning data into knowledge, and knowledge into action to achieve business profit. Wanting to emphasize on the width of business intelligence, the authors explain it as a discipline made up of systems and processes. While according to Bilandžić (2012: 9) "Business intelligence assumes the process of collecting data and information from the internal and external business environment and converting them into business knowledge on the basis of which business decisions are made.", according to Savić and Luić (2016: 231) BI " is a very large set of applications and technologies used to collect, store, analyze and provide appropriate access to data to help users make better and faster business decisions."

Biere (2003: 18) says that BI is a concise and methodical transformation of data from all sources into a new form that provides information to stimulate business and is directed towards the final result. Starting from this definition, he concludes that the purpose of investing in business intelligence is to transform the company from reactive to proactive in relation to data. It is evident that the definitions of BI are converging in terms of content - it is a concept in which large data sets are collected, processed, selected and stored in databases where they are analyzed and converted into useful information that can help in making quality decisions. In this process, BI tools are used - software tools adapted to the processing of large databases and the creation of reports, and the key role in everything is played by analysts who, using various methodologies, try to identify the information that will best serve a specific purpose. (Topić, 2021) In conclusion, almost all analyzed authors share the same understanding of the purpose of business intelligence: to collect raw data, turn it into information in order to ultimately obtain actionable knowledge and intelligence for making adequate management decisions.

The conducted research on which this paper is based analyzed the business activities of Croatian companies receiving EU funds in order to obtain an answer to the research question.

– *Is it possible to recognize with the help of BI tools the overall potential of the company to apply for EU funds?* and in order to confirm the veracity of the hypotheses:

H1: By using the BI tools, it is possible to identify the indicators of financial analysis of business, and for companies that have successfully applied for EU funds, to determine the deviation from the industry average.

H2: By using the BI tool, it is possible to determine the geographical efficiency in the absorption of EU funds and to detect the business performance of the companies that applied for the EU funds.

2. MATERIALS AND METHODS

The research is directed towards the comparison of selected financial indicators of companies receiving EU funds with the same financial indicators at the average level of the NKD (National Classification of Activities) of the industry in which the company operates and in the size category in which the company is located (micro, small, medium or large company). For the purposes of collecting and analyzing the research results, the Microsoft Power BI tool was used, as a tool with the help of which, with the use of BI methodology, the databases of the companies list that signed EU agreements, the databases of basic data about the company based on the submitted GFI (Annual Financial Statement) and the databases on aggregated data for each individual NKD activity were connected. The available databases contain basic information about the company and AOP (Automatic data processing) values, without financial indicators, and the same applies to the databases that aggregate data on individual NKD activities, there are no financial indicators, so the financial indicators had to be calculated. For the purposes of the paper, eight indicators were selected and calculated for each of the 1,044 companies in the observed group. Using the possibilities of the Power BI tool, first it was identified the round of the best companies within the observed group, and then the financial performance indicators that are most represented in the observed companies and that deviate positively from the industry average. Looking for the simplest way to identify these indicators, the visualization capabilities of the Power BI tool were used, which made it much easier to identify the indicators, and the subsequent verification by counting showed that the visual solutions were correct.

The data were collected from the official website: https://strukturnifondovi.hr/, and they relate to data on signed agreements as part of the Call for Project Proposals (tenders) and are publicly available. In total, there were 1,596 signed agreements in the observed tenders. The source of data on companies is the Digital Chamber platform of the Croatian Chamber of Economy: https://digitalnakomora.hr/home. The platform Digital Chamber of the Croatian Chamber of Economy was used as a source of data on the NKD activities of the company: https://digitalnakomora.hr/home.

The empirical part of the research was carried out with the help of business intelligence software tools, which were used to process and analyze the collected data on the company's operations and the use of EU funds, and tested the hypotheses. When processing the research results, the following was used: the analysis method, which by breaking down complex terms into their simpler component parts and elements, a clearer idea of the research subject was obtained; a method of synthesis that connects simple judgments into more complex and general ones in order to find cause-and-effect relationships in the elements of a data set; description method for describing facts, subjects and research processes; the method of descriptive statistics for determining the obtained results and drawing conclusions about the average value and deviations of the elements within the observed set; counting method for determining the number of elements within the observed set. In the second part, data processing was done in the Microsoft Power BI software tool in combination with a Microsoft Excel table calculator. The results are presented in the form of graphs, tables and Power BI visual solutions.

3. RESULTS

In the observed group of 1,044 companies that notified 1,110 EU projects, indicators of business success were identified that deviate positively from the industry average in the observed group. Indicators that stand out in the observed set as indicators that have the most significant positive correlation in relation to the industry average are: indebtedness, current liquidity ratio and economy of the overall activity. The coefficients of individual companies were compared with the average activity by size category – micro-enterprises with the average activity for micro-enterprises, small with the average for small enterprises, and medium with the average for medium-sized enterprises. In the observed set, the best activities were singled out, with an average gross profit per employee of more than HRK 100,000 in the category of medium-sized enterprises and micro-

enterprises, and more than HRK 150,000 in the category of small enterprises. The coefficients of the selected companies were compared with the average at the level of the entire industry (all companies in the industry). The results are presented in Table 1.

Table 1. Identification of indicators according to company size

Company size	Coefficient	Result	%
Small	economy of total activities	14/16	0,88
Small	current liquidity	14/16	0,88
Small	indebtedness	15/16	0,94
Micro	current liquidity	15/17	0,88
Micro	indebtedness	16/17	0,94
Medium	current liquidity	9/11	0,82
Medium	indebtedness	8/11	0,73

The graphic presentation of eligible costs by county on the map of the Republic of Croatia shows that most of the funds were spent in the northern parts of Croatia, the largest concentration of funds is in the city of Zagreb and Zagreb County and in the northernmost counties - Varaždin and Međimurje. The least funds were invested in the Dalmatian counties.

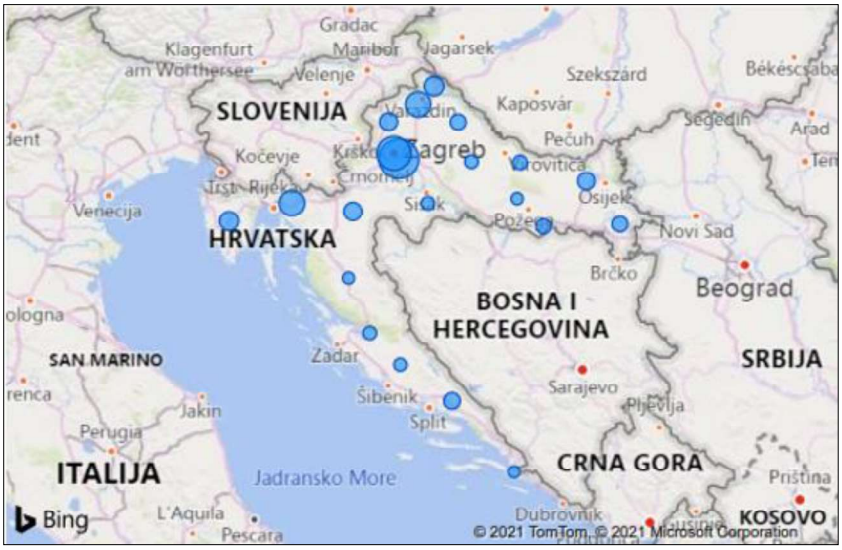


Figure 1: Presentation of eligible costs on the map of Republic of Croatia

The existence of a correlation between the average number of employees in an individual company and the number of companies receiving EU funds that are registered in a certain activity is shown in Figure 2.

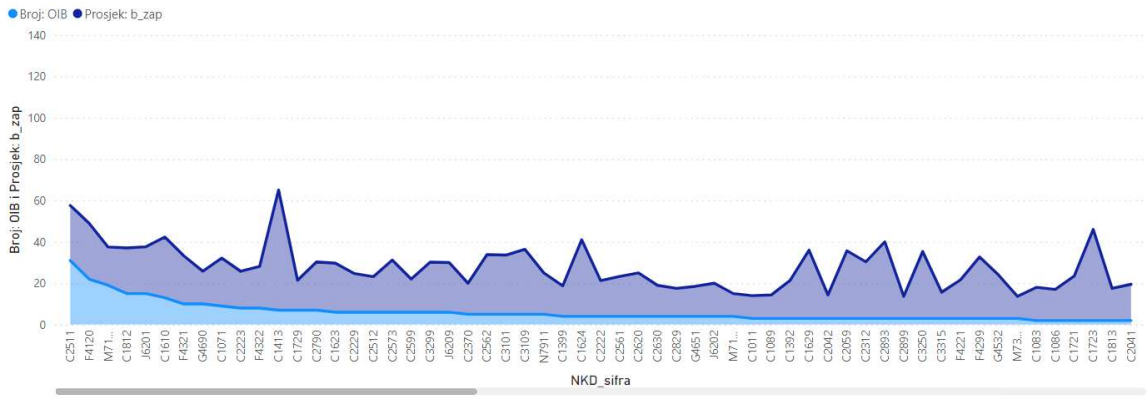


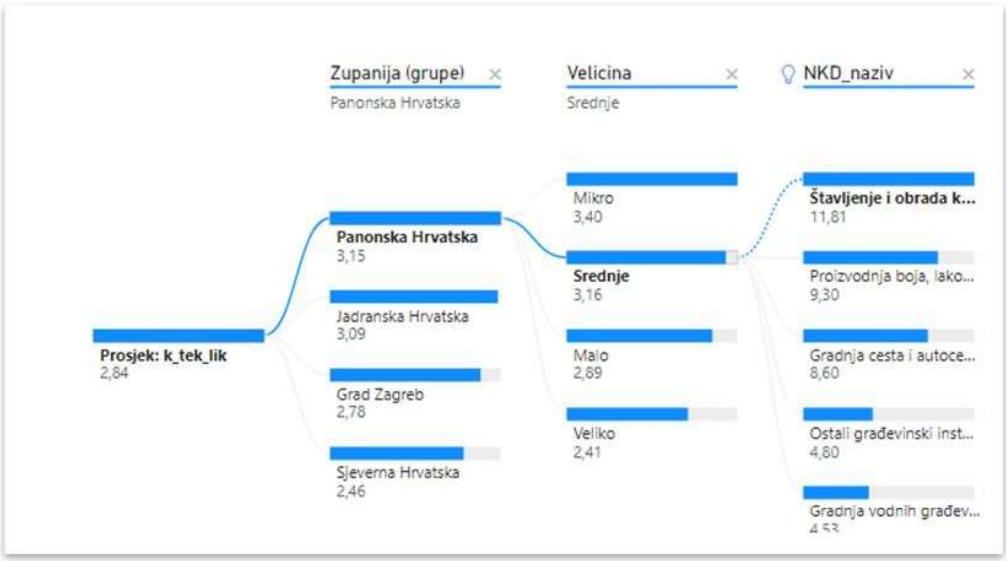
Figure 2. Comparison of the number of companies in the industry and the number of employees

From the results of the conducted research, described in the previous text, it is clear that for companies that have successfully applied to the EU tender, it is possible to determine deviations from the industry average, which set up the **H1 hypothesis confirmed**.

H1: By using the BI tools, it is possible to identify the indicators of financial analysis of business, and for companies that have successfully applied for EU funds, to determine the deviation from the industry average.

By observing the three extracted coefficients, with the most significant positive deviations from the average (H1), it is clear from Figures 1 and 3 that by using the BI tool it is possible to determine geographical units and determine the regional efficiency in the absorption of EU funds, which set up the **H2 hypothesis confirmed**.

H2: By using the BI tool, it is possible to determine the geographical efficiency in the absorption of EU funds and to detect the business performance of the companies that applied for the EU funds.



Slika 3. Prosjek koeficijenta tekuće likvidnosti po regijama

4. DISCUSSION

This paper is focused on an alternative approach to the analysis of the use of EU funds aimed for Croatian entrepreneurship. The analysis was intended to show that the effect of EU funds can also be assessed from the perspective of an individual company, i.e. from the bottom up. With this approach, available resources would be prioritized and goals would be set based on them, instead of first setting goals that are implemented, although it is often questionable how realistic and necessary these goals are.

In companies, it is necessary to recognize the potential, identify what they are best at and try to use that advantage in the best possible way. In this paper, the company's potential was searched in the indicators of the financial analysis of the operations of companies that are beneficiaries of EU funds. In addition, it was shown that with the help of BI tools, a new dimension can be given to the analysis of the effects of the use of EU funds, and that the BI tool is ideal for this type of research because it provides the possibility of formatting, transforming and structuring data from different sources, as well as fast processing of structured data and creation of quick visual solutions for discovering mutual relations within a large amount of data. Afterwards, this research paper showed that it is possible to recognize financial indicators that deviate positively from the industry average and that are significantly represented in companies that are beneficiaries of EU funds. On the other hand, overall potential is too broad term to be covered by eight financial performance indicators, therefore the correct answer to the research question would be – *With the help of the Power BI tool, it is possible to prepare the basis and create an assumption for the creation of a better model for recognizing the company's potential.*

The aim of the paper was to show with the help of BI tools that it is possible to calculate and recognize the indicators that are better than average in the companies receiving funds and which are the most represented in the observed group of companies. The paper showed that it is possible to recognize these indicators, it is possible to recognize patterns of behavior in their mutual correlations and it is possible to mark companies in which these indicators are more prominent as companies with the potential to apply for EU tenders. The greatest contribution of this work has just been stated.

By identifying companies in which certain financial indicators are of more or less quality and are more or less represented in a certain activity, prerequisites are created for creating a model that could identify companies with potential at the level of all companies in Croatia, not only for the implementation of the EU project but for the implementation of a quality project that would bring greater added value than the average. By encouraging such companies, a qualitative step forward in investment projects would be achieved, economic growth would be accelerated, and if EU funds were directed to such companies, the quality of the use of EU funds would also increase. The greatest benefit from the development of such a model would certainly gain entrepreneurs, and those of the highest quality, who can create added value and contribute to the development of the economy. In addition to entrepreneurs, all institutions oriented towards entrepreneurship and towards EU funds would also benefit from it, primarily the line ministries. Additionally, the developed model could be linked and used in national development strategies. The identification of companies with potential also means the identification of activities with potential, which should be used in the creation of national development strategies, but also in the preparation of tender documentation. This paper did not develop a predictive model, but indicated that this is possible by applying BI concepts and tools, and provided frameworks for the continuation of related research.

The corresponding research included 1,044 companies, which is a representative group, but still less than 1% of the total number of companies in the Republic of Croatia. In the further analysis, only the best activities in which companies operate within the selected group were observed, and within these companies, the search was focused on eight indicators of financial analysis of business performance. For the development of a predictive model, a longer-term and more extensive research is needed, which would include all tenders from EU funds, more indicators of financial analysis and would also include the time dimension, in order to finally confirm and elaborate the conclusions of the research in question. Also, more companies and more indicators should be included in the model, and this is an area for future refinement of this research work, both professionally and scientifically.

5. CONCLUSION

The results of the empirical part of the paper confirmed that with the use of BI tools, it is possible to identify the indicators that are most prevalent in companies that are beneficiaries of EU funds, as well as the expected correlation between the beneficiary companies and the quality of operations measured through financial analysis indicators. An assumption has been made for the further development of a model that should be used to identify the capacity of the best companies in investment projects that can create added value and that can serve as a basis for creating future development strategies and for increasing the quality of individual projects and, accordingly, for increasing the efficiency of the use of funds from EU tenders. More companies and more indicators should definitely be included in the model, and this is a space for future refinement of this research work, both professionally and scientifically. In conclusion, in the time we are witnessing, business intelligence represents a necessary need in the process of establishing the real business value of data assets and provides extraordinary possibilities in improving the recognition and exploitation of business opportunities.

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