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THE IMPACT OF MACROECONOMIC INDICATORS ON BROWNFIELD INVESTMENT IN SERBIA

UDC 330.101.541:330.322(497.11)

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Abstract. *The paper analyzes cross-section data for Serbia in the time period from 2005 to 2013. It applies multiple regression techniques and measures the impact of macroeconomic variables on attracting foreign investments in brownfield sites in Serbia. The research has shown that macroeconomic indicators such as unemployment rate, average annual wages, gross domestic product, consumer price and exchange rate are statistically significant, while real GDP growth, subsidies and other transfers are statistically insignificant.*

Key words: *Macroeconomic, unemployment rate, indicators, brownfield sites, liberalization.*

INTRODUCTION

After the fall of the Iron Curtain, many countres of the Central and Southeast Europe faced a powerful deindustrialization process. Many industries became redundant because they could not be competitive in terms of productivity. State-owned companies were losing their markets, which resulted in privatization of their property. Privatization process failed and led to the companies' property deterioration and creation of brownfield sites (Kurtovic *et al.,* 2014).

Inadequate control of risk, which was present for decades in the global banking sector, during those years, was the main generator of the many crises and instability, which shook both financial and real sector. (Radević and Lekpek, 2010). This is a contribution to the reduction of brownfield investments that could not be traced.

Brownfield sites pertain to urban areas in the Southeast European countries. These countries are characterized by a lack of awareness and relevant data with respect to brownfield sites. Unlike greenfield investments where the situation related to potential

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investment sites and facilities is completely clear, in the case of brownfield investments it is much more difficult to attain information related to current use and status of the site. Also, there is no clearly defined list of brownfield sites, no information on contamination level or a clearly defined program of their economic revitalization (Jackson and Grab, 2002). In most countries of the Central and Southeast Europe brownfield sites include industry, military, railway and transport, agricultural, institutional (schools, hospitals, prisons), commercial (shopping centers, offices), cultural (culture houses, cinemas), leisure (sports grounds, parks, open space) (Ferber, 2010).

In Serbia, due to the slow company privatization process and delay in the adoption of the Bankruptcy Law, some of the state-owned companies "turned into brownfield sites" because legal status of investments into current maintenance of buildings and infrastructure, production and the like was not clearly defined. The solutions for brownfield sites lie in priorities, strategies, legal framework, programs and support to investments. Financing of brownfield regeneration by the state is less likely and it is recommended for the public interventions to be primarily focused on in-kind assistance including creation of legal framework, favourable fiscal benefits, favourable use of land, publishing of contamination data, clear and implementable strategies at all levels, informal assistance upon land consolidation, more flexible licensing and the like. Not all brownfield sites in Serbia have the same status or receive the same treatment. There are several types of brownfield sites. The first type implies the good brownfield sites that are being taken care of by the market itself. The second type includes the brownfield sites that do not occupy such an exclusive location and therefore often require strong public support and financial or in-kind intervention. With respect to the third type, we mainly talk about non-commercial locations that are primarily developed for ecological or social purposes. As for the fourth type, brownfield sites are in such a state that they represent a direct threat to health and environment.

However, lately we also have certain change in the direction in which horizontal forms of foreign direct investments move, towards less developed countries or transition economies. This change can be attributed to the process of economic progress of transition economies. Transition economies that record significant economic results see in horizontal forms a possibility for the accomplishment of positive effects. Those effects are particularly reflected in technological transfer, mobility of workers, process of learning and transfer of business philosophy, etc. The mentioned effects are achieved in almost all those industries where horizontal forms of foreign direct investments existed. (Kurtovic *et al.,* 2012).

Regeneration of brownfield sites in Serbia requires both vertical and horizontal approach. Vertical approach encompasses three aspects: state, regional and local level. At the state level, implementation is performed through regulation of internal strategy and national legislation. At the regional level, instruments and measures that will help attract foreign investors are being implemented. Finally, at the local level, attraction of brownfield investments can be stimulated through urban planning and various fiscal measures and land related policies. Horizontal approach pertains to the activities and cooperation with partners on the local community development (Dulic, 2013).

In the European context there are a number of definitions and interpretations, with the most common one suggested by the working group CLARINET (Contaminated Land Rehabilitation Network for Environmental Technologies), which states: "The brownfield are sites that had previously been under the influence of their users and the surrounding

areas, which are neglected or underutilized, which may have potential problems with lack of maintenance, which are located mainly in developed urban areas and require intervention to bring them back to beneficial use and may have real or perceived contamination problems" (CABERNET, 2006; Oliver, *et al.*, 2005). Brownfield sites revitalization in Serbia is at a very low level. One of the reasons for such a state is the rather late adoption of the brownfield definition. Brownfield site is defined in Serbia as the "(…) land which was previously built and used, but in the meantime, due to financial or other economic reasons became abandoned" (Peric and Furundzic, 2014).

Serbia grants high direct incentives to foreign investors in the form of subsidies (EUR 4,000-10,000 per job created, where the average incentive approved so far per job created per foreign company has been 4,693 million euros). Even though Serbia is not alone in giving incentives to foreign investors, since incentives are a method of attracting FDI in other CEE countries as well, it is evident that it is the indirect incentives that are predominant in other countries, such as tax benefits, giving free land, creating infrastructure on the land, and these are mostly offered to large investors only (Gligoric, 2013). In 2014, there were 449 brownfield sites registered in Serbia (SIEPA, *2015)*. Serbian military and Ministry of Defense own the majority of brownfield sites. The Master Plan, adopted as early as June 2006, foresaw the sales of most of the military complexes, the estimated value of which was around one billion euros at the time. In the meantime, a small part of the property was sold for only 10 million euros, while a number of local self-governments became owners of the former military facilities and put them up for sale or lease to interested investors. At the moment, the military owns 3,942 buildings with total area of 2 833 406 m^2 and 21,773 ha of land (Reactivation of brownfield in Serbia, 2011). From 2000 to 2014, Serbia achieved the inflow of FDI in the amount of 21 billion euros. Based on the World Investment Report of 2012, 50% of greenfield investments in the SEE region pertained to Serbia. Brownfield investments during 2012 and 2013 were dominantly made in the energy sector 48%, production sector 20% and trade 7% (Invest in Serbia, 2013).

The main subject of this paper is identifying the current state and the potential of brownfield sites with the aim of attracting FBI in Serbia. It is evident that brownfield sites in Serbia have not been fully utilized during the last two decades and that transitional processes, reflected in the privatization and changes to legislation, have not been sufficiently efficient and fast to enable brownfield sites to attract FBI. To that effect, this paper aims to demonstrate the potential of brownfield sites in Serbia to attract FBI and enhance economic competitiveness. The main objectives of this paper are to study the individual effect of macroeconomic variables on attracting foreign brownfield investments in Serbia. The starting point of this study is the main hypotheses, which we have proven using the multiple regression model. The research hypotheses are as follows:

Hypothesis H_0*: Positive macroeconomic indicators do not have a significant impact on attracting foreign brownfield investments in Serbia or* $H_0: \beta_1 = 1$*. We have also set an alternative hypothesis stating that macroeconomic indicators have an impact on attracting foreign brownfield investments in Serbia or* $H_1: \beta_1 \neq 1$.

The paper consists of sections as follows: the introductory section provides the subject, research objectives and research hypotheses; Section 2 provides an overview of literature or research closely related to this paper's research subject; Section 3 describes

econometric techniques and databases used in the research; Section 4 provides the empirical results of the research and, finally, Section 5 contains the Conclusion.

1. LITERATURE REVIEW

Jankovych (2005) studied the factors based on which a mechanism is created for the selection of sites for reuse or regeneration. The analysis was focused on Germany and France, which have criteria for classification of brownfield sites in place. These countries' experiences were suggested as a possible solution for the Czech Republic. Groenendijk (2006) researched the importance of brownfield revitalization and concluded that this process faces certain problems that require consideration. His research also covered benefits and costs of brownfield revitalization, four models of public-private partnership financial initiatives, legislation, etc. Ganser and Williams (2007) studied the issue of brownfield sites in England and Germany. They particularly tackled quantification of objectives for the development of brownfields at the national level and pointed out the significance of regeneration of urban brownfield sites and the reduction in use of greenfield sites. In his research, Paull (2008) quantified the effect of brownfield reuse on the environment, economy and community. In the economic sense, brownfield reuse helps create new jobs, encourages investments and enhances the environment. Additionally, it prevents total land contamination, gas emissions and creation of greenhouse gases, improves quality of water, etc. Chilton *et al.* (2009) studied the impact of brownfield revitalization in Charlotte, USA on the social, economic and natural environment. They determined a positive effect of brownfield revitalization in all mentioned areas applying ordinary least squares method.

Estrin and Meyer (2010) studied the importance of brownfield acquisition as a way of searching for innovative resources on the fast-growing markets. They applied regression analysis and concluded that many companies that were purchased in the growing markets went through a certain level of reorganization, while simultaneously retaining key competencies that made them recognizable and combining them with the new skills and techniques brought in by the companies that took them over. In his research, Tang (2011) developed a framework for defining brownfield sites for the purpose of enhancement of brownfield revitalization and then analyzed qualitative and quantitative data pertaining to the land use and sustainability. The subjects of his analysis were England and Taiwan i.e. their brownfield revitalization policies and the conclusion was that their policies differed depending on the population density and the level of economic development. Frantal *et al.* (2013) studied the impact of location and specific factors on the successful regeneration of brownfield sites. Using the case of South Moravia they analyzed the spatial and functional distribution of brownfield sites and tested the correlation between the potential of municipalities and brownfield sites that had already been regenerated. Finally, they concluded that regenerated brownfield sites were located in municipalities with greater economic potential. Frank (2014) carried out a research on economic and fiscal benefits, availability of information on brownfields, as well as on benefits for the environment. Based on several case studies on American cities, he determined advantages and disadvantages of brownfields. Frantal *et al.* (2015) performed a comparative study on interest groups or stakeholders from the Czech Republic, Germany, Romania and Poland. The main objective of their research was to study the main factors impacting regeneration of brownfield sites and detect the barriers negatively affecting the

given process. They found that, apart from the total costs, the process of regeneration of contaminated land in Poland and Romania were also affected by the ownership issues, local self-government, legislation, etc.

2. THE ECONOMETRIC MODEL AND DATA

Our economic analysis is based on the application of the multiple regression model and the ordinary least squares (OLS) method. We have used cross-section data for the period from 2005 to 2013. The data has been acquired from the World Bank database (World DataBank/World Development Indicators), National Bank of Serbia, www.naled-serbia.org/search and Eurostat.

Applying the multiple regression model we have measured the impact of macroeconomic factors on the inflow of foreign brownfield investments in Serbia. Within the quantitative approach, we set up brownfield investment as a dependent variable, while independent variables include unemployment rate, GDP, real GDP growth, average annual wages, consumer price, exchange rate and subsidies and other transfers. We chose the mentioned variables based on the relevance of their impact and data availability.

Through application of the multiple regression method we shall attempt to determine the impact of macroeconomic factors on the inflow of foreign brownfield investments in Serbia. Our multiple regression method shall be introduced through the following equations

$$BROWI = \beta_0 + \beta_1\, GDP + \beta_2\, RGGDP + \beta_3 WAGE + + \beta_4 SUBT + \\ + \beta_5\, UNEPL + \beta_6 CP + \beta_7\, ER + , \dots , + \varepsilon.$$

Where:

BROWI – ownfield investment
GDP – gross domestic product
RGGDP – real GDP growth (in %)
WAGE – average annual wages
SUBT – subsidies and other transfers
UNPEL – unemployment rate
CP – consumer prices (in %)
ER – exchange rate
ε – residual or error.

Brownfield investments mostly occur in the form of acquisitions. These investments are essential to the revitalization and economic enhancement of derelict and abandoned sites. Gross domestic product represents a very important macroeconomic indicator showing the value of final goods and services produced in the country within a given year, expressed nominally. Its increase or reduction is a powerful indicator considered by the investors when deciding upon site selection. Also, real GDP growth is an indicator that illustrates the real growth rate of economic activity with respect to produced goods and services. Its positive or negative value plays an important role in the potential investors' decision-making process. Average annual wages is an important factor in the process of attracting foreign brownfield investments. Lower average annual wages means less costs and more profit for a foreign investor, but that is not the case when it comes to vertical investments. Subsidies and other transfers have a powerful impact on attracting foreign investment. It is on their character and scope that the inflow of brownfield

investment, FDI and other forms of investment largely depend. Unemployment rate informs us about the state of macroeconomics. For foreign investors high unemployment rate means access to cheaper labour force. Consumer price pertains to the rate of increase in prices in the host country i.e. inflation rate. High inflation rate poses potential risk for a foreign investor. Exchange rate represents the value of local currency expressed in foreign currency. Undervalued or overvalued exchange rate can have positive or negative implications on the inflow of foreign investment.

3. THE EMPIRICAL RESULTS

Our research resulted in several findings. After the analysis of the correlation between independent variables, we concluded that there is a high correlation between gross domestic product (GDP) and subsidies and other transfers (SUBT) i.e. that their *p - values* are 0.938199% and 0.987257%, respectively. In addition, there is a high correlation between the average annual wage (WAGE) and subsidies and other transfers (SUBT), where *p - value* amounts to 0.890134% (see Table 1). In other cases, there is a moderate negative correlation between independent variables. Based on the above stated, we can conclude that our model does not have a problem with multicollinearity.

Table 1 Correlation between the independent macroeconomic variables

	RGDPG	SUBT	WAGE	UNEPL	GDP	CP	ER
RGDPG	1.000.000	-0.555951	-0.297025	-0.158183	-0.387101	0.245759	-0.661231
SUBT	-0.555951	1.000.000	0.890134	0.120935	0.938199	-0.645457	0.791440
WAGE	-0.297025	0.890134	1.000.000	-0.165814	0.987257	-0.582294	0.532819
UNEPL	-0.158183	0.120935	-0.165814	1.000.000	-0.098945	0.037356	0.489258
GDP	-0.387101	0.938199	0.987257	-0.098945	1.000.000	-0.636118	0.619675
CP	0.245759	-0.645457	-0.582294	0.037356	-0.636118	1.000.000	-0.319250
ER	-0.661231	0.791440	0.532819	0.489258	0.619675	-0.319250	1.000.000

Source: Author's

Note: ***, **, and * represent statistical significance at the 1%, 5%, and 10% level, respectively.

Through application of multiple regression method, we have concluded that in most cases the increase in macroeconomic variables positively affects the growth of inflow of brownfield investments in Serbia (see Table 2). In order to determine the effect of macroeconomic variables on the inflow of brownfield investments in Serbia, we have attempted to observe the individual effect of independent variables on the dependent variable. Thus, the average annual wage ($WAGE$) has a $p - value$ of 0.0167%, which is statistically significant or lower than the determined value of 0.05%, i.e. positively affects the inflow of brownfield investments; therefore, we reject H_0 hypothesis and accept the alternative H_1 hypothesis. There has been no significant increase in the average annual wage in Serbia during the considered time period, which had a positive impact on the inflow of brownfield investments. Lower average annual wage represents a stronger motive for the investor in terms of gaining profit. Unemployment rate ($UNPL$) has a $p - value$ of 0.0321%, which is statistically significant or lower than the determined value of 0.05%, i.e. positively affects the inflow of brownfield investments in Serbia; therefore, we reject H_0 hypothesis and accept the alternative H_1 hypothesis. Unemployment

rate in Serbia constantly grew in the given time interval, which is the result of the poor state of industries within which there was no restructuring of enterprises, as well as of the negative elasticity of demand both in the local market and by the main trade partners. High unemployment rate positively impacted the inflow of investments in brownfield sites and created better conditions for foreign investors.

Table 2 Impact of macroeconomic variables on the inflow of brownfield investments

Dependent Variable: BROWI
Method: Least Squares
Sample: 1 9
Included observations: 9

Variable	Coefficient	Std. Error	t-Statistic	Prob.
RGGDP	45793.45	3703.911	12.36354	0.0514
SUBT	-2138.512	759.1479	-2.816990	0.2172
WAGE	-48810.31	1281.234	-38.09634	0.0167
UNEPL	69910.66	3525.894	19.82778	0.0321
GDP	851.4499	21.73882	39.16725	0.0163
CP	100588.6	2981.566	33.73684	0.0189
ER	-39137.83	1559.063	-25.10344	0.0253
C	-6094815.	287162.6	-21.22427	0.0000
R-squared	0.999530	Mean dependent var		238073.3
Adjusted R-squared	0.996240	S.D. dependent var		343148.9
S.E. of regression	21041.87	Akaike info criterion		22.32697
Sum squared resid	4.43E+08	Schwarz criterion		22.50228
Log likelihood	-92.47136	Hannan-Quinn criter.		21.94865
F-statistic	303.7976	Durbin-Watson stat		1.947094
Prob(F-statistic)	0.044149			

Source: Author's
Note: ***, **, and * represent statistical significance at the 1%, 5%, and 10% level, respectively.

Gross domestic product (GDP) has a $p-value$ of 0.0163%, which makes it statistically significant when compared to the determined value of 0.05%, i.e. it positively affects inflow of brownfield investment in Serbia; hence, we reject H_0 hypothesis and accept the alternative H_1 hypothesis. In terms of GDP, Serbia registered cumulative growth of GDP within the time period under consideration, albeit with a certain fall during 2009 and 2010, which nevertheless had no negative impact on the inflow of brownfield investments. Consumer prices (CP) have a $p-value$ of 0.0189% that is statistically significant when compared to the determined value of 0.05%, i.e. positively affects the inflow of brownfield investments in Serbia; therefore we reject H_0 hypothesis and accept the alternative H_1 hypothesis. Consumer prices i.e. inflation rate was moderate, which had a positive impact on the inflow of brownfield investments. Exchange rate (ER) has a $p-value$ of 0.0253%, which makes it statistically significant when compared to the determined value of 0.05%, i.e. it positively affects the inflow of brownfield investments in Serbia; hence, we reject H_0 hypothesis and accept the alternative H_1 hypothesis. In the case of exchange rate, frequent devaluation of the national currency (dinar) resulted in significant inflow of brownfield investments due to a

positive effect of devaluation on the increase in exports. However, in the case of real GDP growth ($RGGDP$) and subsidies and other transfers ($SUBT$) $p-value$s are 0.0514% and 0.2172% respectively, which renders them statistically insignificant because they exceed the determined value of 0.05% and they do not positively affect the inflow of brownfield investments; therefore, we cannot reject the H_0 hypothesis. Finally, a slow real GDP growth and low subsidies and other transfers have a negative impact on the inflow of brownfield investments in Serbia. This is because majority of subsidies and transfers are aimed at FDI, portfolio investments, mergers and, to a small extent, brownfield investments. In the case of $R-squared$ and $Adjusted\ R-squared$ $p-value$s are 0.999530% and 0.996240% respectively, which means that the observed dependent variable is strongly explained by independent variables. Durbin-Watson statistic has a $p-value$ of 1.947094%, which is within optimum limits i.e. there is no serial correlation. Finally, $Prob(F-statistic)$ has a $p-value$ of 0.044149% that is statistically significant and demonstrates that the applied model is significant i.e. that the majority of independent variables positively affect or explain the dependent variable; therefore, we reject H_0 hypothesis and accept the alternative H_1 hypothesis.

CONCLUSION

After 2000, Serbia initiated certain reforms in the area of opening of the economy, state property privatization and other structural reforms aimed at attracting foreign investors. Implementation of these reforms did not proceed to the desired speed, which led to a failure to achieve significant results in the area of brownfield sites revitalization i.e. to attract investments as an important driver of the economic growth of the country and squalid economies of local communities in particular. One of the main obstructions to the process of revitalization of brownfield sites in Serbia are the unresolved property-legal relations. Apart from this, the process of privatization is rather inefficient and time-consuming, which has caused over 30% of state-owned companies to remain unprivatized. In order to resolve the issue of brownfield sites, Serbia must develop a clear strategy, legal framework and stimulative investment support programs. To that effect, Serbia, as well as other Central and Eastern European countries, has undertaken clear measures as to classify all brownfield sites and it gives primacy to acquisitions as a form of foreign brownfield investment. The proposed measures pertain to the application of fiscal incentives, favourable measures for the use of land and sites, formal assistance in land revitalization, better access to the information on contamination levels, transparent and implementable strategies at all levels, more flexible and shorter time periods for licensing and implementing procedures. During 2006, Serbia adopted the Bankruptcy Law and carried out necessary reforms that brought results in the area of enhancing macroeconomic indicators of business operations. These changes positively affected the inflow of investments in brownfield sites, but their scope remains unsatisfactory having the existing potential in mind.

In our research paper we have applied the multiple regression model and measured the effect of macroeconomic on the inflow of brownfield investments in Serbia. Within the quantitative approach, we set up brownfield investment as a dependent variable, while independent variables include unemployment rate, GDP, real GDP growth, average annual wages, consumer price, exchange rate and subsidies and other transfer. Our research has shown that macroeconomic indicators such as unemployment rate, average

annual wages, GDP, consumer price and exchange rate are statistically significant i.e. that they positively affect the inflow of brownfield investments in Serbia, while real GDP growth and subsidies and other transfers are statistically insignificant i.e. do not have a positive impact on the inflow of brownfield investments in Serbia.

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APPENDIX A

Table 3A Variable definitions

Variable	Data sources
BROWI – brownfield investment	www.naled-serbia.org/search
GDP – gross domestic product at market prices (million euros)	Eurostat
RGGDP - real GDP growth (in %)	National Bank of Serbia
WAGE – average annual wages	National Bank of Serbia
SUBT– subsidies and other transfers	World Development Indicators
UNPEL – unemployment rate	National Bank of Serbia
CP – consumer prices (in %)	National Bank of Serbia
ER – exchange rate	National Bank of Serbia

Table 4A Data pertaining to Serbia

Country	Year	GDP	% RGGDP	%Unpel	Browi	Wage	CP	ER	Subt
SRB_	2005	21.103	5.54	20.80	604.910	209.7	17.7	85.50	0
SRB_	2006	24.435	4.90	20.90	0	260.0	6.6	79.00	0
SRB_	2007	29.452	5.89	18.10	292.000	347.1	11.0	79.23	602.8
SRB_	2008	33.705	5.37	13.60	202.000	400.5	8.6	88.60	675.1
SRB_	2009	30.655	-3.12	16.10	23.000	337.4	6.6	95.88	656.8
SRB_	2010	29.766	0.58	19.20	33.000	330.1	10.3	105.49	654.5
SRB_	2011	33.424	1.40	23.00	979.000	372.5	7.0	104.64	695.8
SRB_	2012	31.683	-1.02	23.90	8.750	364.5	12.2	113.72	691.8
SRB_	2013	34.263	2.57	22.10	0	388.6	2.2	114.64	0

UTICAJ MAKROEKONOMSKIH POKAZATELJA NA BRAUNFILD INVESTICIJE U SRBIJI

U radu se analiziraju podaci preseka za Srbiju u vremenskom periodu od 2005. do 2013. godine. Uz primenu višestruke regresivne tehnike, meri se uticaj makroekonomskih varijabli na privlačenje stranih inveticija u braunfild lokacije u Srbiji. Istraživanje je pokazalo da makroekonomski indikatori, kao što su: stopa nezaposlenosti, prosečne godišnje plate, bruto domaći proizvod, cene potrošačkih proizvoda i deviznog kursa su statistički značajni, dok pravi bruto domaći proizvod opada dok su ostali transferi statistički beznačajni.

Ključne reči: *makroekonomski, stopa nezaposlenosti, indikatori, braunfild lokacije, liberalizacija*

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ANALYSIS OF POSSIBILITIES FOR IMPROVING SERBIAN COMPANIES' BUSINESS ACTIVITY

UDC 005.7(497.11)

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Abstract. *The subject of this paper is the quality improvement analysis for Serbian companies in global conditions of livelihood and key factors for accomplishing competitive market leadership. Serbian economy by analysis cannot be competitive without the fulfillment of the most important condition which is competitive products that meet modern world market requirements. To meet the requirements, it is necessary for Serbian companies to change their way of thinking and implement world achievements in organisation and management areas. Serbian companies that continuously apply current methods and management techniques have significantly higher chances to strengthen their competitive capability on the international market. They are securing a stable market position with a perspective for market rise.*

This paper is trying to find the significance of the mentioned relations in the conditions of relatively insufficient application of new technology and management of knowledge in transitional economies like Serbia by using theory performance and analysis. The ultimate business goal for Serbian companies is to reach business excellence and world class products.

Key words: *management, competitiveness, business, quality, analysis*

JEL Classification: M21, O12, R11.

INTRODUCTION

Business in enterprises today is carried out in global market conditions in which competitiveness is imposed as an imperative of their survival, growth and development. Accomplishing business excellence and world class products and services is the foundation goal of business for all enterprises, including Serbian companies.

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In that sense managers of Serbian enterprises need to be pointed out for their multi-year, breathless focus on operative excellence, changes, restructuring and lowering the costs of business. If desired results are not achieved, primarily raising the level of competitiveness, the approach to business is expected to be changed.

It is necessary to change the way of thinking in the way that success, operational excellence and cost efficiency are not the key to all business problems like it was thought earlier. The focus needs to be changed to reaching the highest possible growth and highest business profit. Managers need to be determined to use maximum potential of their companies to succeed in the global fight for world market ranking. The success of Serbian enterprises' business missions are conditioned by the capabilities of management and leadership. Management and leadership departments need to recognise requests and possibilities of aimed markets and they need to be flexible in reacting to competitors' actions. Reintegration is a complex and responsible task. It is a process in which they need to be qualified for successful competition in the international marketplace.

Aggravating circumstances that stand in the way of Serbian companies to become included in the paths of international economies are the economic crisis and long-standing absence from the global market, which are the consequences caused by international isolation of Serbia - the invisible wall of sanctions. In those conditions, there were inadequate treatments from foreign markets in planned strategy of growth and development of Serbian enterprises (Djordjevic, 2014).

Company managements did not dedicate themselves to the analysis of international competition, because they were looking at the global plan from a distance.

Radical changes of business functions need to be accepted to create good conditions for the international Serbian enterprise scene. They need to be included in European integrations processes. The changes imply a complete market transformation, accepting new ideas and fast reactions from foreign impulses and adjusting to changes.

The changed conditions of livelihood demand new approaches to organisation management studies today as well as different approaches in business practise. There are different models of business and managing enterprises. The new premise which is founded on purview of contemporary management defaults its full state of operation. Management needs to cover the whole process of business, as well as focus on the results and performance in the whole economy chain.

New conditions of business impose many challenges for management which are noticeably different from the usual ones. Taking into account the faster pace of changes, there is an increase of the number of companies that are located on the wrong side of the chart. Also, there is an increasing number of companies that are tangled in net value and economy systems in which they only have partial control. There is a fast decrease of strategy lifetime. The Internet is changing the focus of manufacturer and consumer negotiating strength. Irregularities in business in synergy with destructive effects of new technology is significantly removing the barriers for entering different industries. Global livelihood conditions and lower communication costs are making the way to new industrial branches for strong pricing and for the new competitors on the market.

For an organisation to succeed in business, it needs to establish, maintain and develop competitive market leadership and it needs to be ready to learn constantly. Enterprises have to monitor changes not only on the market but also in science to reach the desired business excellence. Next to general market signs and information that relate to user requests and the level of their satisfaction, special attention needs to be dedicated to

competition analysis. Profitable activities attract competitive companies. Enterprises are forced to research not only direct competitors but those who are the best in their areas. All employees need to be involved because competitive advantage is very important for profitability and for company survival.

This paper analyses international business environment quality and the competitiveness of national economy in the conditions of global changes in the area of business market. The point is that the foundation of corporative analysis is identified by the activities for business quality improvement for national enterprises and their commitment for competitive functioning in the world market.

1. INTERNATIONAL COMPETITIVE SURROUNDINGS

The end of the 20th century marked the turning point in which enterprises from all over the world had to start thinking globally (Kotler and Gary, 1996). Changes are present in the environment. Globalisation and modern technologies are key forces that design the new level of links in world economy. That strong link between development of global market and technological development is a necessity. Technology and knowledge development provides spreading of ideas, knowledge, flows of goods and capital worldwide. The planet becomes a unique market in that way that many industries and enterprises see their growth perspective and developments only in world margins. The processes of economy integrations become predominant.

For manufacturers in some countries, globalisation means that they get their resources from other countries as well as exporting their product to other countries as often as possible. Their competitiveness is based on key skills of organisation and individuals that constantly improve their knowledge. Successful organisation is a gathering of all individuals. Strategy creation is started by collecting objective and quality information from the market by enterprises using their experience and knowledge. Learning from other findings and from the best in the group must be implemented in the concept of managing quality regardless of the model of quality.

To achieve desired business success, next to general market indicators, it is necessary to provide information related to user requests and the level of their satisfaction as well as information about competitors (Hamel and Breen, 2007)**.** Technology gives fast, reliable and cheap transfer of information worldwide, regarding informing relevant company management about the changes in the surroundings.

Changes in the area of market operations on the global level directly influence the process of managing an enterprise while the increase and intensifying of the competitive fight is the key result of the globalisation process. It is very hard to get and maintain competitive market advantage in that kind of surroundings (Porter, 2007). Competitive advantage comes from the value that a company is able to make for their buyers, which exceeds the costs of its creation.

To get the business to expand, open new markets, and establish realistic competitive long-term goals, enterprise business quality excellence is an imperative. All manager efforts must go towards reaching that goal. A new organisation needs to focus on new (unconquered) market segments. They need to focus their energy on them, satisfy their needs and exploit them in the market.

The numbers and diversity of technological and other changes that already happened in the business environment by the end of the last and the beginning of this century have

influenced companies to give close attention to studying the environment. Strategic variants that would help them form, preserve and develop competitive advantage in international marketing. Every state and economy in transition must contain international orientation in management to bring down all barriers. By introducing new technologies, they are turning to strategies that are aimed at buyers and users making competitiveness stronger than ever before (Maksimovic, 2012).

The appearance of newly industrialised countries that are becoming global competitors (China, India and Brazil) and then changing the order of countries in the sense that China and the USA have informally taken over from the first economies of the world by 2014, has changed the model of competitive relations which dominated near the end of the last and the beginning of this century.

Fast market globalisation, the rise of newly industrialised countries, and especially the effects of the world economic crisis were making new competitive relations on the world market. That means that global competitive relationships are changed and established on different foundations. Developed West economies have lots of problems in overcoming negative effects of the economic crisis. Markets that are uprising, like China, have become dominant in the world economic growth.

Most markets in the world are in the mature phase and satiated except for the markets of the newly industrialised countries like China and India. It is in these countries today, China primarily, that the rates of economic growth are significant while the rates in most other countries are small (most countries are below 2%). China today is the fastest growing economy in the world. A great number of newly industrialised countries like India, Indonesia, Turkey, the Republic of South Africa, Mexico, and so on, are seriously starting to take part of the most developed world market countries of the world. Considering the effects of global economic crisis in the next years and the inevitable phenomenon of modern economy - inflation, it is to be expected that most countries of the world would have low rates of economic growth. The distribution of economic resources is very unequal - countries with most world capital at their disposal belong to the group G7 (8). The economy growth prognosis is not optimistic.

Competitive expenses of management and business oriented environment are encouraging investments and creating security in every economy. That environment is needed for Serbian economic subjects to attract foreign investments and rise the level of competitiveness. According to the Conference of United Nations Trade and Development UNCTAD (2013) report, the direction of investment activities shows that for the first time, in 2012, countries in development and economies in transition had more success at attracting foreign direct investments from developed countries. From the global perspective stagnation from foreign investments were 1.65 billion US dollars in 2011 to nearly 1.35 billion US dollars in 2012, after 1.14 billion US dollars in 2009 (and that was 23% less than in the pre-crisis period 2005-2007).

According to "Foreign direct investment report for 2013" ("The FDI Report 2013") the number of SDI projects has plummeted by 16.38% in 2012, while in 2011 a growth of 8.54% was noted compared to 2010. A small amount of direct foreign investments is explained by slower economic growth in China. That led companies to lower capital intensive investments. According to this report, Europe SDI fell by more than 20% and that was most felt in Germany. Poland and Spain recorded a growth of influx by foreign investments. According to UNICTAD, smaller influx increase of SDI is expected in 2014 when the level of SDI could reach 1.6 billion US dollars and 1.8 billion US dollars in

2015. Certain risks still remain. The weakness of the global financial system, lower growth in the EU and significant political insecurities in areas that are key for investor trust (http://blog.vip.org.rs/?p=304).

Global competitive relations are even more burdened by negative operation effects of the world economic crisis. Notable investments have only attracted developing countries in Latin America (Chile, Mexico) and southeast Asia in which China exceeded 120 billion US dollars. Hong Kong attracted 75 billion US dollars and Singapore 57 billion US dollars. Foreign direct investments on the market of India have fallen by 27.4% in 2010. The influx to Africa was lowered by 14.4%. Best hosts for SDI between 2013 and 2015 were again China and the USA, then India, Indonesia, Brazil, Germany.

There is no exit from the current economic crisis for now. Maintainable growth of foreign direct investments will demand solving the debt crisis in Europe, safety policy in the USA and greater political stability in the Middle East and parts of Africa. There is little probability that there will be growth in foreign direct investments before the end of 2015**.** The world is functioning in conditions of economic depression. The only defence from economic collapse is understanding its logic. The globalising world is faced with noticeable different opinions. Globalising market is opening perspective to unimaginable wealth. At the same time it is increasing its vulnerability and danger from new fears between those who are a part of globalised world and those who are not. That leads to political restlessness and war confrontation.

All functioning aspects come to the fore that encourage competitive enterprise value. Business is done on a global plan and it is increasing the intensity of competition. Reaching business excellence is the result of functioning from all business functions.

2. Competitive Analysis of Serbian Enterprises' Business Activity

It is known that without question, most Serbian enterprises today are not competitive enough on the global market. Serbian economy is located on a notably lower level of development in relation to the one that was 20 years ago. It is exposed to far stronger competitive pressure than before. Low level of competitiveness is found as a consequence of low business productivity and insufficient application of new technology and knowledge (Miletic, 2009). The situation is similar in large number of enterprises that come from countries in transition.

It was observed that Serbian enterprises were not competitive on the international market during the 80s and the beginning of the 90s. Those enterprises that in monopolised national market conditions somehow got through to the international market made results thanks to overwhelming costs by unproductive business on home consumer.

The low level of Serbian enterprise capability has once again stood out in the works of global economic crisis. According to the new list of 2014 World economic forum, Serbia occupies 94th place out of 144 countries that were analysed. That is a leap by seven places, considering that four countries were not analysed. Serbia was in the 101st place in 2013. In 2012 and 2011 it occupied 95th place, which means that there was a fall in the level of competitiveness. An interesting fact is that Serbia found itself in company with Argentina this year (104th place). Greece, which was equal last year (96th place), had now strengthen its competitiveness (91st place). As far as surrounding countries are concerned, Bulgaria is 62nd, Hungary 63rd, Romania 76th and Albania 95th. The position of other countries in the surroundings is shown in Table 1.

Table 1 Rank of some Balkan countries according to competitiveness in 2008-2013

Country	1) Place in 2009	2) Place in 2010	3) Place in 2011	4) Place in 2012	5) Place in 2013	6) Place in 2014
Montenegro	62	49	60	72	67	67
Slovenia	37	45	57	56	62	70
Croatia	72	77	76	81	75	77
FYROM	84	79	79	80	73	63
Serbia	93	96	95	95	101	94
Bosnia and Herzegovina	109	102	100	88	87	n.a.
Albania	96	88	78	89	95	97
Greece	71	83	90	96	91	81

1) Report included 133 countries; 2) Report included 139 countries; 3) Report included 142 countries; 4) Report included 144 countries; 5) Report included 148 countries; 6) Report included 144 countries.
Source: WEF 2007-2013

Low business productivity, very little investment in research activities and inappropriate use of business quality improvement concept stood out before all other factors as key reasons for Serbian companies' uncompetitiveness on the global market (Trbovic, 2011). Low quality, small number of products that were adjusted to international standards, series of small quantities, unattractive design and packaging, old technologies and high prices of products are the main reasons why Serbian products cannot compete with global market leaders' products and newly industrialised world companies.

National companies are doing business with very old equipment. According to Serbian Chamber of Commerce, the average age of equipment is 29.5 years. Serbia is lagging behind the European Union in technology by at least 20 years. For example, the average age of machines and equipment in Austria is 8.5 years. This country has similar natural, social and population characteristics when compared to Serbia, so it is good for comparison. Compared to this country, Serbia is lagging behind by 21 years (web 21). Without new equipment and the reindustrialisation of economy Serbian enterprises can hardly make goods that meet European standards (table 2).

Table 2 Age of equipement and machines in Serbian industry by economy branches.

Economy branche	Average age
Textile industry	35.17 years
Mechanics industry	34.67 years
Construction industry	30.51 years
Chemical industry	28.67 years
Food industry	27.17 years
Pharmaceutical industry	21 years

Soruce: Serbian Chamber of Commerce, Economist no 619-620, 12 April 2012 EMG Belgrade page 12-13.

Referent analysis by the Serbian Centre for economic research show that state administrative offices are effective at work for 3 hours and 45 minutes a day. Field work is 25 minutes longer. Productivity is 42% of the European average. The reason for that is bad work organisation and lack of knowledge and new technologies. The consequences are uncompetitiveness, low number of jobs and consumer decline.

Innovative activities of enterprise subjects in the Republic of Serbia were researched by the Statistical Office of the Republic of Serbia. It was published for the period from

2010 to 2012, and the sample included 3,984 enterprises. From all of the subjects, 48.1% contributed to one form of innovation. Also, the research showed that the surveyed Serbian enterprises (regardless of the size of the enterprise) mostly aimed at organisation innovations (28.8%). There were process innovations and marketing innovations with 25.98%. Increasing the level of innovativeness is by all means a necessary precondition for successfully acquiring long term business success, profitability and competitiveness.

Out of all Serbian enterprises that are conducting business in the international market, the biggest number have an international certificate. According to 2012 ISO data, there were 3,650 international quality standard certificates. Enterprises that have some of the international certificates mainly belong to the group of large and medium enterprises. The application of international quality standards when it comes to small enterprises' business activities is very unsatisfactory. It is often the case that Serbian enterprises that export goods have some of standards and certificates which shows the fact that very few of them are capable for exporting. The key argument for the low application of quality systems for national enterprises is the low material situation.

The Republic of Serbia is trying to create a qualitative surface for improving business environment with the goal of increasing competitive strength. The competitiveness sector is supporting the institutions in charge of strategic document manufacturing that are meant for raising the level of competitiveness. It is taking part in preparation and conducting of European Union projects and programs. By operative support and coordination it is helping competitive clusters by suggestions and analysis of activities for development and uprising of business conditions.

3. Activities Agenda for Quality Improvement of Serbian Enterprises

Global environment influence is creating the need for enterprises to create competitive and innovative products and services. Without fulfilment of the most important condition which is competitive products that satisfy technical and security demands of international market, Serbian enterprises cannot be competitive. Their business orientation has to take note of strategic management and the conditions present on the global market. It is necessary not only to adjust to current changes in the given business environment, but to surpass internal barriers of organisation growth. By doing that, management and leadership will recognize the requests of targeted markets and will react flexibly to competitors' actions. The success of the whole business mission of the enterprise will depend of it.

The openness to changes and adjustments will become the source of successful management and it will enable enterprises to function competitively. It will require:

- observing and introducing changes in the organisational structure
- changes in production and market strategies
- changes in enterprise growth strategies and management
- business connections for increasing enterprise competitiveness
- successful use of knowledge and employee training (Yukl, 1998).

Competitive international market battle is happening in quality products and pricing domain. All enterprises that want to gain a higher level of business on a global level must control and improve quality. A large number of different factors and activities on different levels are affecting competitiveness. Management has the task to identify and conduct activities that will prepare the enterprise for the highest rank in the competitive battle (Fitzpatrick and Burke, 2003; Prabalad and Ramaswamy, 2004).

Research results that analysed Serbian enterprise managers' attitudes towards implementation of modern methods and management techniques show key interferences in development of competitiveness (Miletic, 2009).

A few of them stood out:

- old equipment and technology - 23.4%
- lack of financial capital - 21.3%
- lack of knowledge – 22.1%

Dominant missing factors for development of competitiveness of Serbian enterprises, according to managers, are:

- continuous improvement of knowledge for managers and employees
- activities related to adjusting the process of projects and manufacturing within the requests of international market -15.3%

When talking about essential factors that have an effect on improving business quality of Serbian enterprises, the surveyed managers stressed

- the need to improve employees - 28.2%
- increasing the level of business quality - 19.7%
- using modern methods and management techniques - 12.1%

The mentioned elements and limits are choosing the business ambient for the process of organisation managing. Other, not less important, factors need to be mentioned. Factors that are shown by the results. Those factors are fulfilling the problematic picture of business quality improvement for Serbian enterprises. Problems in question are related to:

- devastating effects of the world economic crisis
- long term insufficient financial resources
- slow adoption of the modern achievements in the area of management.

It should be emphasized that efforts are made to overcome the negative characteristics of Serbian social and economic reality by finishing reforms in multiple sectors and by affirming new systems of values and business quality. Serbian enterprise managers are aware of the fact that improving employees is inevitable and that it is necessary to use modern methods and techniques of management. Quality systems must be improved especially. It is urgent because quality, price, technological level and safety is the basis of products. Serbian companies can achieve much more if they work together, like a group of connected companies, service providers and organisations that matter to their business within suitable clusters. Globalisation of business for small and medium enterprises which are dominant in Serbian economy represent a very important strategy. The request for enterprise networking is a necessity because the increase of productivity and creating innovations is needed for survival on the global dynamic market.

The problem of competitiveness improvement is basically a question of using modern methods and management techniques in which the concept of quality management has the central part. Extensive use of quality improvement concept is representing the most important factor of competitiveness improvement for Serbian enterprises, especially the wide use of series ISO 9000. Without a doubt, management standards and their use represent tools with the biggest use.

The appropriate use of knowledge represents the most important way for competitiveness improvement of home business subjects. Most of them are not adopting modern management trends fast enough. On the other side, new conditions of economy require new approach to business. Inadequate methods and management techniques have to be abandoned and modern empirical and practical achievements have to be used. Alongside with continuous education of

managers and employees. New organisation construction needs to be put to special attention. For a company to reach market success, it is necessary for it to have maintainable competitive advantage. It needs to be seen in a form of lower costs and different products. With continuous innovation strategy, long term product security and high quality services.

Changed business conditions require the use of integrated management systems as the key direction for improving competitiveness of Serbian enterprises. Wider and more adequate use of international management standards that build integrated management systems in small and medium enterprise groups (Bozilovic and Miletic, 2014). Different systems of management (quality management system, environmental protection system, health and safety systems, secure information system, food safety regulation system) can be integrated to the level that suits the most to the organisation with minimising duplicates at the same time. Any management system that Serbian enterprise uses with the aim of improving the level of business quality always has its specific elements and requests. By use of adequate specifications and resists, management system integration can achieve tangible advantages on the market related to promoting competitiveness and improved focus on business quality.

CONCLUSION

The world economic crisis whose end is in sight, has changed the conditions of business that especially relate to resource management and market competition. Business quality improvement is the foundation for improving all factors that show Serbian competitive ability in international borders. Competitive advantage cannot be achieved and maintained in a way that was before the crisis. Signposts of expected development in the competitive domain and managing an organisation are seen through rising of the innovation level, flexibility and business productivity. Without fulfillment of these conditions that require substantial funds and an envious level of knowledge for realisation it is not possible to speak of quality functioning for Serbian enterprises. Those are the determinants that set the competitiveness of functioning by the Serbian economy in international economic relations and securing integration of its companies in the international business environment.

Enterprises that actively and continuously apply modern methods and management techniques have a realistically higher chance of strengthening their competitive ability on the global market and take a stable market position with a perspective for future market growth. Serbian enterprises have to look for successful market development through clear creation of own growth strategy and by successfully implementing methods and techniques of management that support competitiveness.

Rising the level of Serbian enterprise competitiveness is under direct influence of the quality management concept for integrated management systems. Better use of knowledge in organisation, development of institutions in business environment and development of legal regulations are the key ways to act so as to add to the development of competitiveness of national business subjects.

It is very hard to have a precise evaluation of key positions and limits that define the ambient in which the process of enterprise management is happening in relation to using modern techniques of management based on the analysis of local manager attitudes. Results show that the essential problem is the lack of funds, effects of the world crisis and the lack of knowledge. As the level of business quality is rising, their integration in the international business environment will define the functioning efficiency of Serbian economy.

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ANALIZA MOGUĆNOSTI UNAPREDJENJA POSLOVANJA SRPSKIH PREDUZEĆA

Osnovni predmet ovog rada je analiza mogućnosti unapređenja kvaliteta poslovanja srpskih preduzeća u globalnim uslovima privređivanja, kao ključnog faktora za postizanje konkurentske prednosti na tržištu. Sve analize ukazuju da spska privreda ne može biti konkurentna bez ispunjenja najvažnijeg uslova, a to su konkurentni proizvodi koji zadovoljavaju sve zahteve savremenog svetskog tržišta. Da bi domaća preduzeća postala konkurentna u međunarod¬nim okvirima, neophodno je da promene način razmišljanja i implementiraju svetska dostignuća u oblasti organizacije i menadžmenta. Srpske kompanije koje aktivno i kontinuirano primenjuju savremene metode i tehnike menadžmenta imaju znatno veće šanse da ojačaju svoju konkurentsku sposobnost na međunarodnom tržištu i da osiguraju stabilnu tržišnu poziciju sa perspektivama za očekivani tržišni rast.

Ovaj rad pokušava teorijskim izvođenjima i analizama da utvrdi signifikantnost navedenih relacija u uslovima relativno nedovoljne primene novih tehnologija i menadžment znanja u tranzicionim ekonomijama kao što je Srbija. Dostizanje poslovne izvrsnosti i svetske klase proizvoda i usluga jeste krajnji cilj poslovanja srpskih preduzeća.

Ključne reči: *menadžment, konkurentnost, poslovanje, kvalitet, analiza.*

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MAXIMIZING SALES UNDER CONDITIONS OF NONLENARITY

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Abstract. *This paper deals with the problem of maximizing the sales of a particular product when the revenue function is nonlinear in dependence of the demand for that product. This type of problem is usually solved by the nonlinear programming method which has been sufficiently described in mathematical theory; however, its use is not that simple. Solving functions of more than two variables is rather complicated and requires an appropriate mathematical model as well as suitable software for computer solving of the given problem, which sometimes involves team work.*

Key words: *Nonlinear programming, Kuhn-Tucker conditions, revenue function, demand*

INTRODUCTION

Problems in nonlinear programming appear when the objective function, that is, a corresponding system of constraints, is defined by nonlinear dependencies. Unfortunately, there is no universal solution to these problems, as there is for linear models, the majority of which are solved, for example, by the Simplex method. Moreover, the LP model is a special case of the general NLP model and a number of different methods and procedures have been developed for its solving. In most cases, all of them depend on the type of nonlinearity that exists in the specific NLP problem, which means that a large number of these problems have not been solved yet. This is exactly the reason why we have chosen to describe the most important terms, mathematical models and procedures for solving these types of problems in this paper.

a. Formulating NLP problems

The general task of nonlinear programming on which we will focus our attention here is the following:

Minimize the function $f(x)$, ie .find min $f(x)$ with constrains –inequalities:

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$$g_i(x) \le 0 \qquad i = 1,...m,$$

Whereby f, $g_1,...g_m$ functions are defined in R^n, and $x \in R^n$.

As with the LP problem, the task is to find the vector

$$x = (x_1,...,x_n)^T \in R^n$$

which satisfies the given constraints and is, at the same time, consistent with the minimum value of function $f(\mathbf{x})$. This function is called **the objective function**, and every condition $g_i(x) \le 0$ $i = 1,...,m$, refers to its **constraints**. Vector $x \in R^n$ which satisfies all constraints is called **feasible solution** or **feasible point**. A set of all feasible solutions makes a **feasible region or a feasible set** $S \subseteq R^n$**.**

So, the problem in nonlinear programming is finding the feasible solution x^*, whereby $f(x^*) \le f(x)$ for each feasible solution x. A vector x^* is called **optimal** or a **solution** of the NLP problem.

The NLP problem, of course, may be defined as function maximizing $f(x)$ or defining max $f(x)$ with constrains – inequalities in the following form:

$$g_i(x) \ge 0, \qquad i = 1,...,m.$$

In special cases when the objective function is linear and all the constraints are in the form of linear equations, inequations or their combination, the problem discussed above will become a linear programming problem, i.e. the standard maximum and minimum problems or some combination of the two.

b. Kuhn-Tucker optimization condition

As already mentioned the results of Nonlinear Programming Theory in mathematics are well-known and described. They are of course used in this paper on the example we had studied and which is related to an increase in the demand of a company. Therefore, it may be useful to give a brief description of these results so that we can understand all the procedures applied in the problem solving process.

The analysis of the functions that are a result of the direct and Lagrangian dual problem (well-known in the NLP theory) leads to a set of facts which primarily offer the needed and sufficient optimization conditions for the solution of both problems. The application of Lagrangian principle is based on the famous Kuhn-Tucker Theorems which occupy an important place in the convex programming theory and as such will be in the center of our attention. Assume that X is a nonempty open set from R^n, and that f, g_1, ..., g_m are formerly defined real n-dimensional functions. Now let us consider again the problem of function minimization $f(x)$ under the following conditions $x \in X$ and $g_i(x) \le 0$, $i = 1,...m$. To accomplish this, let us fix an arbitrary permissible point $x_0 \in X$, and present it as follows

$$I = \{i \,|\, g_i(x_0) = 0\}.$$

Assume now that functions f and g_i are differentiable at x_o, and vectors $\nabla g_i(x_o)$. for $i \in I$ linearly independent.

Function $f(x)$ which is differentiable at x_o, can have only one vector – gradient $\nabla f(x_o) = \left(\frac{\partial f(x_o)}{\partial x_1}, \frac{\partial f(x_o)}{\partial x_2}, \ldots \frac{\partial f(x_o)}{\partial x_n} \right)^T$, whereby $\frac{\partial f(x_o)}{\partial x_i}$, $i = 1,...,n$ are partial derivatives of $f(x)$ at x_o. At this point we introduce

Theorem 1.1. (Kuhn-Tucker Theorems - Necessary Conditions). *Suppose that* $x_0 \in X$ *is the local optimum of the given optimization problem, then there are numbers* $u_1, u_2, \ldots u_m$ *that lead to the following*

$$\nabla f(x_0) + \sum_{i=1}^{m} u_i \nabla g_i(x_0) = 0 \tag{1}$$

Whereby $u_i g_i(x_0) = 0$ *and* $u_i \geq 0$ *for each i=1,……,m.* □

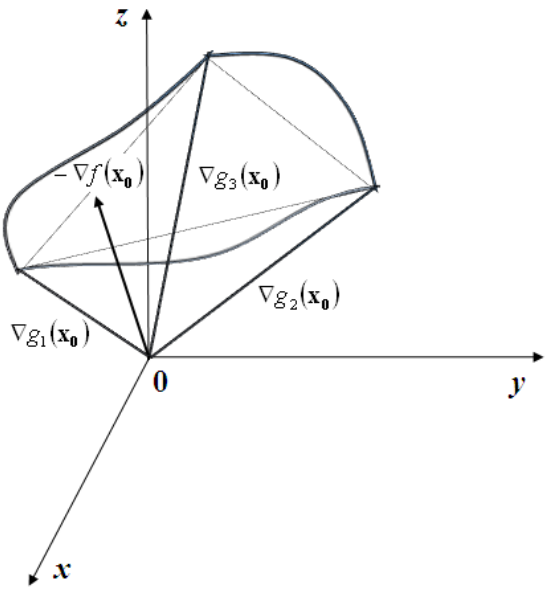

Fig. 1 Geometric interpretation of Kuhn-Tucker optimization conditions

The geometric interpretation of Kuhn-Tucker optimization conditions are shown in Figure 1. The arbitrary vector as a linear combination is as follows:

$$\sum_{i \in I} u_i \nabla g_i(x_0), \qquad u_i \geq 0,$$

and must lie in the cone defined by the gradient vectors $g_i(x)$ which define the constraints at x_0. So, equation (1) leads to the following:

$$-\nabla f(x_0) = \sum_{i \in I} u_i \nabla g_i(x_0), , \tag{2}$$

So vector $-\nabla f(x_0)$ belongs to the cone defined by the gradient vectors of active constraints $g_i(x)$ at x_0 if it meets Kuhn-Tucker optimization conditions. Here, as elsewhere, the numbers $u_1,...u_m \geq 0...$ are called **Lagrangian parameters or multipliers**, while the following equations

$$u_i g_i(x_0) = 0, \qquad i = 1,...m, \tag{3}$$

are called **complementary elasticity conditions**. Kuhn-Tucker conditions may be expressed by forming a vector:

$$\nabla f(x_0) + u^T \nabla g(x_0) = 0 \quad \wedge \quad u^T g(x_0) = 0 \quad \wedge \quad u \geq 0$$

whereby $\nabla g(x_0)$ is the $n \times m$ matrix in which i-column equals the gradient $\nabla g_i(x_0)$, and $u = (u_1,...,u_m)^T$ is m-dimensional vector of the Lagrangian multipliers. However, in practice the vector coefficient is usually calculated as follows:

$$u_i = \begin{cases} 0, i \notin I \\ \alpha_i, i \in I \end{cases}$$

whereby $\alpha_i > 0$, are solutions for a system of linear equations (2). Obviously, this linear system is equivalent to the system (1); therefore, on the basis of the linear independence of vectors $\nabla g_i(x_0)$, $i \in I$, we can conclude that its solution α_i, $i \in I$ is unique.

Theorem 1.2. (Sufficiency of Kuhn-Tucker Conditions)
Suppose that f and g_i, $i \in I$ are convex and differentiable at $x_0 \in R^n$. If Kuhn-Tucker conditions are satisfied at the same point, ie. there are u_i, $i \in I$ such that (1) is true, then x_0 is a solution to the global minimization NLP problem.

Theorem 1.3. (Arrow - Ethoven)
Suppose that the given nonlinear program is as follows:

$$\max \xi = f(x)$$
$$\text{Under the condition } g_i(x) \leq r_i \qquad (i = 1, 2, ...m)$$
$$x \geq 0$$

and the following conditions are satisfied:

*(a) the objective function $f(x)$ is differentiable and **quasi-concave** in the non-negative orthant.*

*(b) all constraint functions $g_i(x)$ are differentiable and **quasi-convex** in the non-negative orthant.*

(c) The point $\bar{x}$ satisfies Kuhn-Tucker maximization conditions.

(d) One of the following conditions is satisfied:

d1. $f_j(\bar{x})$ at least for one variable x_j.

d2. $f_j(\bar{x}) > 0$ for a variable x_j that takes on positive value without any loss in constraints.

d3. Not all n derivatives of function $f_j(\bar{x})$ are equal to zero, while function $f(x)$ is twice more differentiable in the neighborhood of $\bar{x}$, i.e. all second order partial derivatives are at $\bar{x}$.

d4. $f(x)$ is a concave function

then $\bar{x}$ has maximum of $\xi = f(x)$. □

c. Sales maximization

The objective of a typical micro-analysis of businesses primarily means profit maximization. However, the management may consider maximizing sales revenue a more important business objective than maximizing profit (this also depends on different organizational structures the management deals with). Total revenue P_u is one of the most important parameters that describe company's competitiveness in an industry. One of the criteria of the company's success and good management is whether the company increases its sales revenue or not. In that way and due to business results, profit as a parameter directly affects the system of rewards, i.e. the salaries of all employees including the salaries of the management.

In other words, sales maximization is certainly an alternative goal of any organization, given that the company's management, in order to avoid shareholders' dissatisfaction, continually takes care that the total income level does not go below the defined minimum, i.e.,

$$\min D_u(x) = \xi_0 \tag{4}$$

In that case the problem that the company's management has to deal with is maximizing the total revenue function $P_u = P_u(x)$ considering the following constrains condition

$$D_u = P_u(x) - T_u(x) \geq \xi_0 \tag{5}$$

Whereby $D_u(x)$ is total income, $P_u(x)$ is total revenue; $T_u(x)$ refers to total expenses and x to production volume or demand. This condition can also be shown as follows:

$$\max P_u = P_u(x)$$
$$\text{under the condition} \quad T_u(x) - P_u(x) \leq -\xi_0, \quad (\xi_0 > 0)$$
$$x \geq 0$$

The question of whether Kuhn-Tucker conditions can be applied to this model or not primarily depends on the following two things: whether function $P_u(x)$ is differentiable and concave, and whether function $T_u(x)$ is differentiable and convex. If this is so, the constraints function $D_u = T_u(x) - P_u(x)$ is also differentiable and convex, which means that Kuhn-Tucker necessary conditions can be applied.

Of course, it is unlikely that we could draw more general conclusions based on assumptions about concavity, that is, convexity of quasiconcave function Pu(x) and – quasiconvex function $T_u(x)$. If we do consider such assumptions, then constraints function $D_u = T_u(x) - P_u(x)$ is the sum of two quasiconvex functions, while, at the same time, we cannot claim that the function itself is quasiconvex. If this be the case, then constraints function $D_u(x)$ can be transformed into quasiconvex, which further allows the application of sufficient conditions for extreme values.

Under these conditions we use θ to denote the Lagrangian:

$$\theta = P_u(x) + y(-\xi_0 - T_u(x) + P_u(x))$$

Kuhn-Tucker conditions are composed of boundary conditions:

$$\frac{\partial \theta}{\partial x} = P_u'(x) - yT_u'(x) + yP_u'(x) \leq 0$$

$$\frac{\partial \theta}{\partial y} = -\xi_0 - T_u(x) + P_u(x) \geq 0 \tag{6}$$

$$x > 0$$

In the case of $P_u(0) = 0$ and $T_u(0) > 0$, i.e. that production is equal to zero, $x = 0$, then the following will be the case:

$$\frac{\partial \theta}{\partial y} = -\xi_0 - T_u(0) < 0$$

which shows that the second boundary condition is not fulfilled. Instead, we have to assume that $x > 0$, the condition which is absolutely in accordance with the fact that the production level that is equal to zero cannot be an element of the optimal solution set $[x_1, x_2]$.

Due to the non-negativity condition $x > 0$, we can say that $\partial\theta / \partial x = 0$, which means that the first weak inequation (6) has to be fulfilled as an equation. The solution of that equation refers to the rule according to which we can define production as the one which maximizes sales with the following constraints:

$$P_u^{'}(x) = \frac{y}{1+y} \cdot T_u^{'}(x) \tag{7}$$

Where y can be equal to or greater than zero, i.e. $y \geq 0$, if $y = 0$, this rule boils down to $P_u'(x) = 0$ while the company will tend to achieve production whose marginal revenue is as a follows:

$$P_g(x) = P_u^{'}(x) = 0$$

Since the company would make maximum profit possible under these circumstances this would be output under ideal conditions. However, bearing in mind our assumptions, such an extreme situation is not possible because demand, x_i which makes possible the afore-mentioned conditions is outside the set of possible solutions, i.e., $x_i \notin [x_1, x_2]$. In that case we have to assume that $y > 0$; however, this further means that $\partial\theta / \partial y = 0$ on the basis of which we can conclude that profit constraints hold with equality while the company tries to make at least minimum income ξ_0. Assume that $y > 0$, this is the case when the output level maximizes sales, or in other words when marginal revenue is less than marginal cost, i.e.

$$P_u^{'}(x) < T_u^{'}(x) \qquad \text{because} \qquad \frac{y}{1+y} < 1 \tag{8}$$

which would generally lead to higher output levels than the profit maximization rule, i.e., $P_u'(x) = T_u'(x)$, the case when marginal revenue is equal to marginal cost.

The particular problem we are dealing with here is the possibility of increasing sales of, i.e., demand for Ariel, the washing powder, sold at **Maxi** supermarket in Zajecar, (Belgian international food retailer **Delhaize Group**). The gained discrete data set shows nonlinear dependence among the parameters we were interested in. Therefore, we opted for nonlinear programming in order to solve the optimization problem – in this particular case, maximum sales.

The paper further lists research methodology including the problem solution. Since revenue function $P_u(x)$ is unknown as well as total expenses $T_u(x)$ and total income $D_u(x)$ functions, the first step is to compute these functions on the basis of statistical discrete data set, i.e. the empirical data we gained after having conducted a survey in the above

mentioned company. The approximation method was used to compute functions as shown in Table 1.

Table 1 Discrete Data Set

x	$P_u(x)$
1	89.00
3	261
5.50	464.75
6.80	565.76
8.40	685.44
11.00	869.00
12.50	968.75
14.70	1106.90
16.20	1193.56
18.50	1322.75
20.00	1400

x	$T_u(x)$
1	5.5
3	207,00
5.5	295.75
6.80	386.72
8.40	445.68
11.	623.00
12.	743.75
14.70	945.27
16.20	1099.32
18.50	1361.75
20.00	1550.00

Table 1 shows the survey results carried out at **Maxi** supermarket in Zajecar, (**Delhaize Group**). What we did was to monitor the sales of the washing powder Ariel in the period of 30 days. In the very table, x stands for demand and refers to $kg \cdot 10^2$ and functions $P_u(x)$ and $T_u(x)$ stands for RSD $\cdot 10^2$.

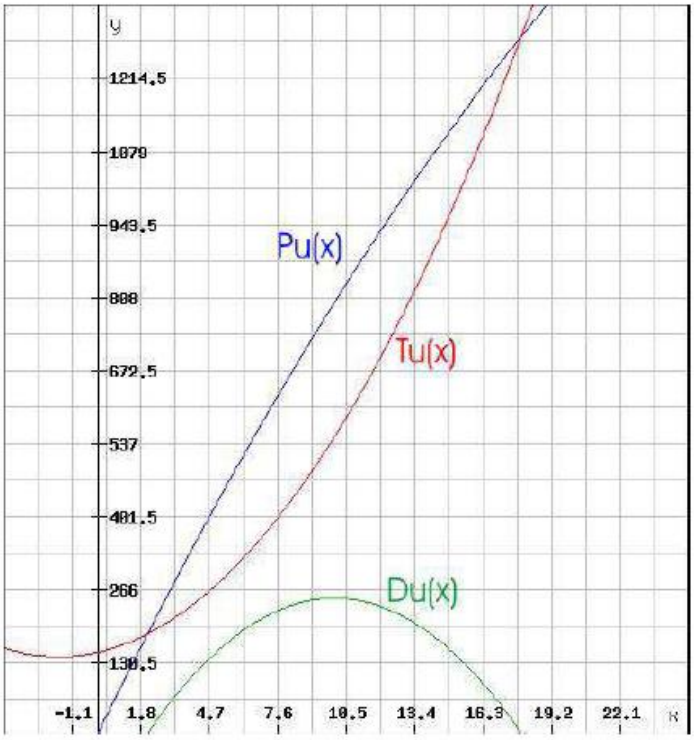

Fig. 2 Graph of approximate functions of total revenue, expenses and income

On the basis of the empirical data we gathered during the research, and which are shown in Table 1 where the **approximation method** is used[1], see [6], we can now compute the necessary functions; i.e. total revenue

$$P_u(x) = -1,0005x^2 + 89,988x \tag{9}$$

total expenses

$$T_u(x) = 3x^2 + 10x + 150 \tag{10}$$

and total income $D_u(x) = P_u(x) - T_u(x)$ all shown in Figure 2.

Now, we can apply the described Kuhn-Tucker optimization conditions to sales maximization, which as a consequence has an increase in the total revenue.

The optimization problem that arises here is how to maximize the following:

$$\max P_u = P_u(x)$$
$$\text{under the condition } \; T_u(x) - P_u(x) \le -\xi_0, \quad \xi > 0$$
$$x \ge 0$$

Also, total income $D_u(x)$ cannot be less than $50 \cdot 10^2$ i.e., one of the constraints conditions is the following:

$$\xi_0 \ge 50$$

If we apply Kuhn-Tucker conditions, our starting point is the following:

$$\frac{\partial \theta}{\partial x} = P_u\,'- yT_u\,'(x) + yP_u\,'(x) \le 0 \tag{11}$$

$$\frac{\partial \theta}{\partial y} = -\xi_0 - T_u(x) + P_u(x) \ge 0 \tag{12}$$

Then, after the application of function differentiation rules in (9) and (10), and appropriate replacing in (11) and (12), we can arrange the inequations and finally get the following:

$$\frac{\partial \theta}{\partial x} = -2,001x + 89,988 - y\left(8,001x - 79,988\right) \le 0 \tag{13}$$

$$\frac{\partial \theta}{\partial y} = -4,005x^2 + 79,988x - 200 \ge 0 \tag{14}$$

Now, if we assume that $x = 0$ in (14), we have that $-200 \ge 0$ which is contradictory.

Therefore, condition $x > 0$ generates the following relation:

$$x > 0 \Rightarrow \frac{\partial \theta}{\partial x} = 0 \tag{15}$$

which further leads to the following:

$$-2,001x + 89,988 - y(8,001x - 79,988) = 0 \tag{16}$$

[1] The approximation method is discussed in (6), *Operational research*, with original software solutions, ***Methods***, which enable the computer application of this method.

Furthermore, condition $y = 0$ generates the following:

$$-2,001x + 89,988 = 0 \tag{17}$$

from which we calculate x, i.e.

$$x = 44,9715$$

If value x is now used in (14), we will have the following:

$$\frac{\partial \theta}{\partial y} = -4693,57 < 0$$

which is contradictory to condition $\partial\theta / \partial y \geq 0$. Therefore, if we assume that $y > 0$ we will have the following equation:

$$\frac{\partial \theta}{\partial y} = 0 \Leftrightarrow -4,005x^2 + 79,988x - 200 = 0 \tag{18}$$

The following roots are calculated by solving the quadratic equation (18):

$$x_1 = 2,9296 \qquad x_2 = 17,0649 \tag{19}$$

Let us now check whether the solutions we arrived at, the roots x_1 and x_2 satisfy the Kuhn-Tucker conditions. If we replace root x_1 in equation (15), i.e. in (16), we will have that $y = -1,488$, i.e. $y < 0$, which is contradictory to the previously given condition $y > 0$. Thus, we can conclude that root x_1 in equation (18) does not satisfy the Kuhn-Tucker conditions. If we apply the same procedure with the other root x_2 in equation (18), we get that $y > 0$, which satisfies the Kuhn-Tucker conditions, in this case in relation to the demand.

On the other hand, the total income function D_u is as follows

$$D_u(x) = -4,0005x^2 + 79,988x - 150 \tag{20}$$

If this function's differentiation gives a derivative equal to zero, we have the following:

$$D_u^{'} = -8,0001x + 79,988 = 0 \tag{21}$$

By solving this equation (21), we get the following values for x:

$$x = 9,9984 \tag{22}$$

The solution given at (22) stands for the demand or output volume whereby the total income D_u is maximized in relation to the product (washing powder). Furthermore, if we compare the root x_2 of the equation (18) with x, i.e. $x_2 > x$, we can conclude that $x_2 = 17,0649$ and that is the value that maximizes the total revenue function under the condition that the minimum value of the total income is as follows:

$$\min D_u = \xi_0 = 50 \cdot 10^2 .$$

CONCLUSION

Thus, the problem is solved and we also confirm our hypothesis on the possibility of sales increase, i.e., that there are certain situations, depending on the market conditions, when it is possible to increase sales of a product at the expense of decreasing the total income.

The case we illustrated also shows that the major idea in NLP numerical solving when there are two variables is this: zero is to be taken as the value of each variable, which significantly simplifies boundary conditions since a number of members vanish in the process and therefore the mathematical model is rather simplified. If it is possible in this way to find appropriate non-negative values of the Lagrangian multipliers that satisfy all the boundary conditions in inequations, the solution which equals zero is the optimal one. However, if some of the inequations are disturbed, that will indicate that one variable or *more* are positive. For each positive value of the variable it is possible to loosen the conditions by changing the inequation into the equation. Solving that equation will lead either to a solution or to a contradiction. If we end up with a contradiction, we will have to search for new ideas and repeat the process all over again.

It is also worth mentioning that if there are functions of more than two variables in nonlinear models, the very process of optimization problem solving becomes more complicated; therefore, it is necessary in such cases to write a suitable software since it will be more appropriate to use a computer for solving problems of this type. This, in most cases, especially when we deal with complex problems, requires teamwork.

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MAKSIMIZIRANJE PRODAJE U USLOVIMA NELINEARNOSTI

U ovom radu razmatramo problem maksimiziranja prodaje određenog artikla u slučaju kada je funkcija prihoda nelinearna u zavisnosti od tražnje određenog proizvoda. Ovakav zadatak se u principu rešava metodom nelinearnog programiranja, koja je u matematičkoj teoriji dovoljno opisana, ali njena primena nije tako jednostavna. U slučaju funkcija sa više od dve promenljive rešavanje ovakvih zadataka je veoma komplikovano i zahteva konstrukciju odgovarajućeg matematičkog modela, kao i pisanje softvera, kojim bi se postavljeni zadatak rešio na računaru, što ponekad zahteva timski rad.

Ključne reči: *Nelinearno programiranje, Kuhn-Tucker-ovi uslovi, funkcija prihoda, tražnja.*

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APPLICATION OF XBRL-A IN THE FUNCTION OF IMPROVEMENT OF QUALITY OF FINANCIAL REPORTING IN MONTENEGRO

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Abstract. *After more than a century-long and successful history of providing accounting and audit services, the accounting profession is faced with numerous challenges and opportunities of the 21st century. In parallel with the development of new technologies, organizational solutions and establishment of financial reporting standards, a strong expansion of software tools for the exchange of business information has been evident in the last decade.*

*At the end of the nineties of the last century the e**X**tensible **B**usiness **R**eporting **L**anguage – XBRL appeared, which has been one of the most important technological innovations in financial reporting, collection and exchange of data since the invention of electronic spreadsheets.*

In this sense, the goal of this paper is to evaluate XBRL aimed at improving the quality of financial reporting, highlighting both positive and negative aspects of this standard for the exchange of business information.

However, although the XBRL standard is globally accepted, and it has proved to be a kind of evergreen – which, according to many, promises a revolution in financial reporting and exchange of business information - the fact is that the implementation of this standard has not yet become a reality in Montenegro and the region. Hence, one of the goals of this paper is to point out to the relationship of reciprocity between the application of the XBRL standard in accounting practice with the level of development of accounting regulations, training of professional accountants and the willingness of national standard establishers to accept the need for standardizing financial reporting with respect to the exchange of information.

Therefore, we have stated the above so that we could clearly indicate that it is a great scientific challenge to illuminate a new and still unexplored area for our conditions in terms of the application of modern methods of accounting theory and practice. In this context, it will be very interesting to focus on Montenegro, which is moving towards Euro-Atlantic integration, and which has so far had the opportunity to face a number of

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institutional and regulatory problems which have raised doubts in a way about the use value of financial reporting.

Key words: *XBRL, financial reporting, Internet, company, accounting standards, regulations, stakeholders, globalization.*

INTRODUCTION

Dynamic changes personified by general globalization and development of information technologies, as well as the loss of confidence - caused by the global financial crisis – have a significant impact on the role and characteristics of the accounting profession and the accounting information system in general. On the one hand, the expectations of the market, that is the stakeholders' expectations for timely, more frequent, more transparent financial reporting appropriate to the requirements of today are increasing. There is no doubt that the transparent and quality financial reporting provides more secure access to investment funds, reduces uncertainty and risk, and enables the efficient allocation of capital. On the other hand, rapid changes in the information technology have led to a significant representation of e-business and so-called digital economy, which has also had an impact on the accounting profession and financial reporting. The conventional approach to financial reporting, which is mainly based on hard-paper copies of documents and a wide variety of incompatible formats for data exchange (*pdf, xls, html, doc*, ...), had been designed long before the emergence of the Web and new technologies for the exchange of business information (*Cloud computing, XBRL etc.*).

In this sense, XBRL - the international standard for the exchange of business information and data in an electronic form represents one of the innovations and challenges of a modern company. Otherwise, efforts to establish the standard for the preparation and exchange of business information, sponsored by the *American Institute of Certified Public Accountants - AICPA*, date from 1999 when the first meeting of the Steering Committee of XBRL organization was held. Although not the first, but certainly one of the key implementations of XBRL as a global standard is the adoption of the standard by the *Security and Exchange Commission - SEC*, which will undoubtedly represent a significant impulse and will greatly change the world of financial reporting.

In this sense, the intention of the author of this paper was to point out the contemporary trends of the development of corporate business reporting through detailed elaboration of this issue and to show the necessities, characteristics and possibilities of the application of the XBRL standard, with special reference to the possibility of implementation in Montenegro with the aim of improving the quality of financial reporting.

In the context of what was mentioned above, we are going to implement the set objectives by dividing the paper in two parts, in addition to the introduction and concluding remarks. The first part of the paper will deal with the definition of a conceptual framework for XBRL, where the basic features, benefits, application, and components of this standard will be explained in order to create the fundamental preconditions for pointing out the need and usefulness of its introduction. The second part of the paper, which is a logical continuation of the first, deals with the practical dimension of the elaborated theoretical issues, where the guidelines will be provided in the domain of implementation of the XBRL model in the function of the improvement of quality of financial reporting in Montenegro, with emphasis on the analysis of legal and professional accounting regulations as a precondition for successful application of the XBRL standard.

1. BACKGROUND ON XBRL

Although the term business reporting is encountered in the very name of **XBRL**, which is undoubtedly one of the main aspects of its function, it is clear that it has a much wider application. If reporting is viewed as a subset of the business information exchange, XBRL can be defined as:

- The standard based on an open code, independent of any software manufacturer - which offers a wide range of advantages in storing, handling and analysis of data;
- The extension of *XML* intended for the electronic exchange of business information;
- One of the most successful formats for metadata;
- International non-profit consortium of more than 600 members - professional federations, companies, regulatory agencies gathered on the jobs of creation, maintenance and promotion of a uniform standard for the exchange of information (XBRL.org);
- The global agreement on the concept of exchange of business information and rules;
- The mandate by the regulatory agencies worldwide;
- A new way of distributing and modeling of business information in a form understandable for computer applications, which completely relocates business reporting onto the Internet.

It is obvious that these definitions explain XBRL from different aspects, including inevitably its technical side. However, for the purposes of this paper we will only deal with the business aspect of this standard, without ignoring the fact that this has been one of the most important technological innovations in financial reporting, collection and exchange of data since the invention of electronic spreadsheets. Various resources that provide more technical details on XBRL are available (Bergeon 2003; Hoffman, C., R. Egmond, 2012; www.XBRL.org).

In this sense, XBRL can be defined as an open international standard, independent of the information platform, for timely, accurate, and efficient electronic data collection and storage, manipulation and exchange of financial and business statements and data. Although it is primarily used in financial reporting today, it can equally be used in non-financial reporting and exchange of reporting and information contents on the broader, social and environmental aspect of company's operations. In fact, the XBRL standard is also used in the new stage of the evolution of corporate reporting - integrated reporting, which, in addition to financial reporting, includes a specific form of non-financial reporting on sustainable development, sustainable business and corporate social responsibility (Malinić, 2013).

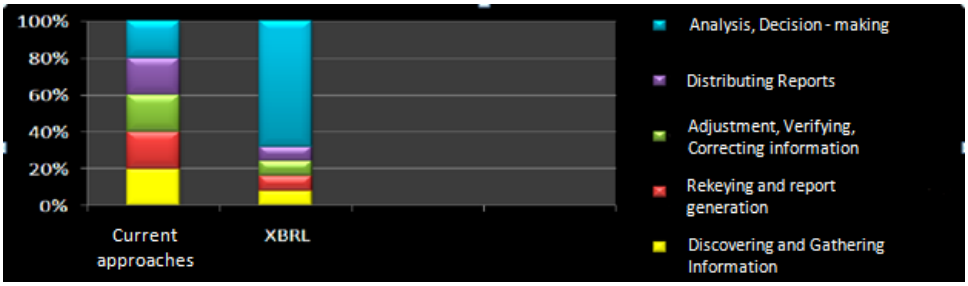
Basically, the idea on which XBRL is based is very simple. Instead of treating the data as the blocks of text, every single position in the statement receives an appropriate label (tag) that adds meaning and context to the data, which enables more effective manipulation, storage and sharing of computer applications through the *Web*. Tags are often compared and identified with bar codes on products which once completely redefined the trade process. Namely, the XBRL is based on the mapping of each position in the financial document which is called the XBRL *Instance* and which represents a unique form for various forms of digital accounting reports. The positions marked in such a way are precisely defined in the dictionaries, called the *Taxonomy* (Hoffman, 2010, 18). It is important to emphasize that taxonomies do not represent an integral part of the digital financial statement, but are databases on the basis of which multiple statements are created. They can be located on the *Web* or within the company's intranet. In addition,

any business user can customize the taxonomy to their own needs by adding specific concepts and positions, or develop a new taxonomy on the basis of the existing one. It is known that the possibility of modifying and adapting taxonomies is one of the unique features of XBRL which is called scalability.

This type of standardization and exchange of data significantly increases the flexibility and speed of data manipulation, and reduces the need to re-enter the data (*rekeying*) while preparing the statements for each user in the chain of reporting. Just create one statement in XBRL, which can then be distributed via the *Web* for multiple use (press statement, web site, submission to regulatory and tax authorities).

2. Benefits And Risks Associated with XBRL

Before we look at individual benefits, which are reflected on all actors in the chain of business information exchange, if we would like to show the key benefits of XBRL in only one graph which recommend it for the implementation in a specific organization, it would look like this:



Graph 1 Current versus XBRL-based information exchange model

Therefore, a comparative review points out the significant advantages of XBRL, which are reflected in the savings in costs and time through the automation of the processes that generate a lower added value and which are more susceptible to errors of human intervention (collection and re-entry of data, preparation of statements), compared to the processes of high added value. The application of XBRL completely redefines the accounting practice where a high level of analyses and consultancy services is increasingly required with the aim of providing adequate information support in decision-making, instead of the past fee-for-service approach.

Finally, XBRL has the potential to upgrade the *one-size-fits-all* approach in financial reporting with the *á la carte* choice of financial information. Some of the benefits, as pointed out in various sources, are briefly reviewed below (see Ales, 2008; Barton, 2003; Bergeon, 2003; Watson, 2010; Hawes, 2013; Hoffman, 2010, Malinić, 2013; Martic, 2013).

2.1. Benefits for users of information

In the accounting literature, it is a common view that only the users of information enjoy the benefits of application of XBRL. In support of this view it is stated that opposed to the creators of information who perform demanding tasks of tagging or labeling XBRL information, the users enjoy the benefits of an easy access and manipulation with this

information. While we are going to try to supplement the aforementioned positions on the following pages and to point out to the fact that XBRL offers advantages in the preparation of financial information and statements, there is no doubt that XBRL generates a range of benefits for the users (Hoffman, 2010, Bergeon, 2003; Martić, 2013), including:

- **Faster access to information**. Thanks to the differentiation of information from the applications offered by XBRL within its modular infrastructure, numerous processes are automated, so the access to information is faster. This is one of the reasons why the regulators and stock exchanges around the world are leaders in the implementation of XBRL.
- **Information collection (breakdown**). If you have ever collected information from two or more people who present that information in tables, then you have a very good understanding of the problems of data collection. Different presentation formats make data collection very complex. Even if we have the same software versions and use standardized tabular formats, unintentional errors and inconsistencies in communication may create problems during the exchange. On the other hand, the XBRL standard changes the options for the exchange offering a unique standard that provides efficient exchange of consistent information.
- **Flexible information format**. When you get a certain set of information, how many times have you wished to receive that information in another format? With XBRL, the reformatting of information is very easy. Information can be automatically retrieved from the databases and taxonomies, exchanged in XBRL and then exported to another format of your choice.
- **Information is not locked in one presentation format**. This benefit actually stems from the previous one. Namely, the flexibility, scalability and dynamism are basic characteristics of business information exchange through the XBRL standard.
- **The possibility of automated search of information.** Thanks to XBRL, the search of financial information can be much easier, because it uses a standard format in which structured information is presented. Moreover, the application of XBRL includes standardized metadata so that analysts can analyze and compare companies more easily.

2.2. Benefits from the aspect of information creators

We have already emphasized that the advantages provided by XBRL to the users of information are more explicit compared to the advantages that this standard offers to the creators of information. Considering the fact that the process of tagging of XBRL data is a labor-intensive task, however, we can point out a whole range of benefits (Bergeon, 2003; Watson, 2010; Hawes, 2013; Hoffman, 2010) regarding the creators of information:

- **Lower costs of information production**. Essentially, preparation of financial statements through XBRL is based on the identification-tagging of each position in the statement, making in this way savings in costs and time through the automation of processes that are more susceptible to errors of human intervention and the need for the re-entry of data.
- **Communication with customers on a constant basis**. By using XBRL, the communication with users takes place virtually in real time on a constant basis, bearing in mind that the data are precisely defined within the taxonomies while labelling and presented in the standard based on open code available to all users.
- **Enhanced functionality** - connecting the relevant sources to the documents ensures better preparation to the environment. Policies, resources and other relevant contents are contextually available through a XBRL document.

- **Flexibility** – XBRL greatly increases the flexibility and speed of data manipulation in its original form. Thanks to the separation of the information from the presentation format, the creators of information are provided with significant flexibility regarding the manner in which the information will be presented.
- **Built-in validators and standards** - One of the key advantages when creating information. The information is retreated from taxonomies that represent the standardized vocabularies of accounting principles. They also include built-in validators, which enable detecting the errors before they enter the system, which significantly increases the quality of data.
- **Multi-language support**. As the global standard, the XBRL neutralizes the language barriers enabling the expression of definitions in the language of your choice. Therefore it is possible to display a series of statements in a language different from the language in which the statements have been prepared without any additional intervention. The XBRL community largely uses this possibility because in this way data consistency is ensured and invisible boundary represented by language barriers, which interferes with the free flow of information, is neutralized.

Stakeholders' analysis

It is well known that the pluralism of interests and intertwining of the influence of stakeholders in the functioning of a company causes the existence of different company goals (Malinić, 2008). Without going deeper into the issue of relations between stakeholders, which is very complex and subtle, the analysis that we are going to conduct shows in which way the movement from a proprietary - paper format to an electronic format affects them.

First, the stakeholders adversely affected by this change are:

- Manufacturers and suppliers of paper;
- Software manufacturers (except for XBRL), since the XBRL standard is globally accepted and has quickly taken a dominant role in an era of software tools and techniques which we are constantly bombarded with by consulting companies and manufacturers of accounting software.
- IT departments can provide resistance to ensure the infrastructure and support to the system, which basically relies on the Internet. This is primarily evident in organizations that have a policy of preventing the access to the Internet. The main challenges are security issues and possible abuse by employees;
- Smaller accounting firms that do not have the staff trained in electronic reporting and IT can also be adversely affected by the transition to XBRL.

In contrast to the short list of stakeholders, the list of those who gain benefits from the application of XBRL is extensive. It includes various manufacturers of software, hardware and telecommunications equipment, then, state agencies, banks, end users, analysts, etc.

- State agencies have more reasons to support the XBRL initiative, given the amount of data processed and the time necessary for processing. As we have mentioned several times, the application of XBRL increases the flexibility of data processing, and shortens the time needed for data collection.
- Large companies. As a result of the Enron scandal, financial regulators have shortened the deadlines for submission of financial statements. In this regard, companies are under pressure to prepare reports with fewer errors as soon as possible. Employees are required to devote more time to the analysis of data, rather than to its preparation.

- Small businesses are becoming more visible in the market, and therefore can offer new services. Once companies publish their statements in XBRL they become more visible on the Web.
- Auditors - an old joke among auditors says that the acronym *CPA* actually means ***C**ut, **P**aste and **A**ttach*. Even in the era of computerization, auditors spend excessive time transferring data from the field in their own statements and estimates. Moreover, auditors are faced with increasing regulatory burdens. Therefore, they tend to spend less time on the manipulation and preparation of data than on the analyses.
- When it comes to individual organizations, the degree of benefits obtained by XBRL depends to a large extent on their technological status. Namely, computerized companies, which provide their employees with free internet access, and which have the staff trained in IT, will make a more painless transition to the new reporting system.

2.4. Risks associated with XBRL

In addition to numerous advantages, we have to be aware of certain challenges that we face when adopting a new technology – standard, such as XBRL:

Early adoption of XBRL as a global standard has led to a lack of preparation and inadequacy in its application. The need and the necessity to meet the demands of the regulator as soon as possible, at a time when many of the XBRL software applications were not available, prevented the identification of appropriate adaptation solutions of the entire accounting information system. Another feature is derived from the previous one, that is, a lot of regulators obliged the regulatory entities to use XBRL, while not providing any assistance in its implementation. It initially resulted in significant costs for business organizations, bearing in mind the need to engage consultants who would generate the XBRL filings for them.

The fact that the standard is relatively "immature", as well as the software support on which it relies may cause certain problems in the compatibility of software applications, especially compared to earlier versions of the program. For example, if two different software manufacturers support XBRL with their applications, those applications may not be fully compatible (Bergeon, 2003). Customization of taxonomies so as to meet the specific demands of stakeholders, makes the problem of compatibility even greater. Namely, the XBRL Taxonomies are expandable and therefore can be too flexible, which may significantly jeopardize the transparency and compatibility of statements, and eliminate the many advantages that this standard offers (Burnett, 2006).

The existence of a number of "competing" standards and the fact that XBRL, like any other standard, has a limited life cycle and is likely to undergo numerous changes in the future. Experience tells us that most of the new software tools, methods and techniques are just "fashionable topics" which gain but also immediately afterwards lose relevance. A whole range of factors, which are very difficult to predict, contribute to its relevance.

Since it is based on XML, it is considered that the implementation of XBRL is somewhat complicated and difficult, especially for accountants, regulators and business users. While the implementation of XBRL can be made in a relatively short period of time, it will probably be necessary for some time to maintain the previous accounting information system, which will undoubtedly require additional costs and lead to errors in submitting financial statements.

Given that XBRL completely relocates the financial reporting onto the Internet, the issues of security and protection of information are raised; although these issues are not in the domain of the standard itself.

Finally, the considerations made clearly show the advantages that the application of the XBRL standard brings to all participants in the chain of financial reporting and business organization, both in terms of preparation and use of information. It is perhaps justifiable to underline that perhaps the most important benefit of the implementation of XBRL is that it permanently eliminates the need to re-enter data when preparing the statement for each user in the chain of reporting. Moreover, it is important to emphasize once again that XBRL is not a new accounting standard and that it does not require changes in existing accounting standards, nor does it require businesses to disclose additional information.

But the practice shows that there are certain risks associated with the adoption and integration of XBRL, but the risks of ignoring the information revolution that has transformed virtually every form of business on the planet, are potentially greater.

3. MAJOR XBRL PROJECTS AT THE GLOBAL LEVEL

The previously made considerations have shown that XBRL is globally present (especially in the practice of market-developed countries), and that it represents a new phase in the evolution of financial reporting. The implementation of XBRL is likely to follow the direction as in the case of *XML* and *HTML* – that is, the standards are firstly adopted by supervisory and regulatory bodies, and then they are rapidly accepted by an increasing number of business users. In the context of a more current and deeper consideration, we will examine below in more detail some of the most important projects of the implementation of the XBRL standard - which will allow us to look at how this standard is implemented and used, with a special emphasis on quantifying the potential benefits and savings.

- **U.S. Security Exchange Commission.** Although not the first, but certainly one of the key implementations at the global level, is the adoption of the XBRL standard by the SEC, which had closely monitored the past projects of the implementation of this standard and began with the introduction in 2005, when an experimental program was launched in which each company could test the standard. After the successful implementation of the pilot testing, the *SEC* obliged all public companies to submit financial statements in the XBRL format. In June 2009, more than 500 major companies started with the submission of the statements in this format, followed by about 1,800 companies the next year and about 12,000 companies in the third year (Securities and Exchange Commission, 2009). Finally, in 2012, the *SEC* obliged all public companies to submit financial statements in the XBRL format.
- **Federal Financial Institutions Examination Council -** In 2003 **FFIEC** launched the project of modernization of the system for data collection and management. The new system, known as the *Central Data Repository – CDR* represents one of the first and largest implementation of the XBRL standard. In this respect, the survey results (Federal Financial Institutions Examination Council, 2003), in terms of savings brought by the application of the XBRL standard, can be synthesized as shown in the following way:
  - Savings of about 60% are achieved in the costs of data collecting and processing;
  - The data processing time has been significantly reduced (the processing time has been reduced from 60 to 2 days);

- Productivity has been increased in the range of 10 to 33%;
- Data errors are completely eliminated (the previous system identified 18,000 errors annually);

It can be noted that the results of the application of the XBRL standard through an open, collaborative approach have been impressive. The implementation of XBRL has had a positive impact on the increase of productivity, efficiency, accuracy and quality of data. The statements are available much more quickly, with the more efficient and more accurate process of data collection and validation. The new data collection system allowed the banks to identify and correct the errors before filing their financial statements. All this will undoubtedly encourage other regulatory agencies to implement this standard.

- **Standard Business Reporting - SBR**. In 2007, in its project of the Standard Business Reporting, the Australian Government funded the first phase of implementation of XBRL as a standard means of communication between the government and companies, as well as between government agencies. This project aims to simplify and automate the process of information exchange, i.e. by functioning in a way that companies do not have to submit the same information several times to different agencies. It is expected that this project will reduce the costs of companies by 25%, or more than one billion dollars per year (Standard Business Reporting, 2012).

How successful the Standard Business Reporting project is, is best illustrated by the fact that it is gradually becoming a global approach in the implementation of XBRL at the level of state administration, and that similar projects have already been launched in many countries, such as the Netherlands, New Zealand and Singapore. Moreover, we believe that this project provides useful guidelines for the application of this standard at the level of state administration in Montenegro and the region.

- **Accounting and Corporate Regulatory Authority** as the national regulator seeks to provide a reliable regulatory environment for companies and public accountants. To successfully respond to the goals presented in this way, new demands and challenges of economic operations, the ACRA adopted the XBRL standard for corporate financial reporting in 2007. In the beginning, the most important goals of the project of implementation of XBRL focused on the improvement of financial reporting through value enhancement of information flow with the local and international business community. In order to facilitate the implementation of XBRL, the ACRA has created the *of-line BizFinx* application for electronic processing and recording of data, which allows users to prepare financial statements free of charge in accordance with changing regulatory requirements. In order to minimize the time required for data entry, the tool includes a feature that automatically maps the information in the financial statement. Finally, from the end of October 2013, in accordance with the revised regulatory requirements, the ACRA obliged the companies to submit a complete set of financial statements in the XBRL format (Accounting and Corporate Regulatory Authority, 2013).

Although the project of the XBRL standard implementation in Singapore cannot be considered as one of the most significant in global terms, both in terms of its relevance and scope, we believe that it provides useful guidelines for the application of this standard at the national level. This is primarily so, given the negligible costs for users in terms of compliance with regulatory requirements during the preparation, creation and validation of the XBRL statements. Moreover, we believe that this project is an example

of the best practice of involving the public in decision-making and active approach of interested users when reviewing the regulatory requirements and introducing the new accounting and information solutions in the financial reporting system.

3.1. Common features of XBRL projects

We have seen that the first implementations of the XBRL standard were achieved in the field of financial arena, led by regulatory agencies, such as securities commissions, stock exchanges, tax and customs authorities, banking regulators, i.e., organizations that deal with large quantities of financial statements and information. Today, the standard has been accepted by different business organizations, auditing and accounting firms, manufacturers of software for accounting and business reporting, as well as individual investors and analysts. Although these are heterogeneous groups, it is possible to identify some basic trends in the development and implementation of XBRL:

- With respect to the projects at the state level, each state has appropriate functions - agencies that enable and encourage the implementation of XBRL within that state, such as the regulators of stock exchanges and securities, bank regulators, business registries, tax agencies and national statistical organizations;
- The implementation of XBRL follows the direction as in the case of *XML* and *HTML* – that is, the standards are firstly adopted by supervisory and regulatory bodies, and then are rapidly accepted by an increasing number of business users. In this regard, the supervisory and regulatory agencies play an important role in the introduction and implementation of XBRL, given the huge number of businesses they control. When adopted by one regulator, the number of businesses which have implemented the standard exponentially increases;
- At least one non-profit organization (*Microfinance Information Exchange-MIX, 2003*) has implemented the XBRL standard;
- Any significant shortcomings in the implementation of XBRL have not been observed so far;
- Stock exchanges and bank regulators are the two largest groups that have implemented XBRL;
- The regions in the world where XBRL is growing fastest are the USA, Japan, Europe, China and Australia. However, looking at the current situation and trends in the development of XBRL, we can see significant differences in the models of implementation of this standard in specified regions:

In Asia and the USA, XBRL is predominantly used in the capital markets. However, given the significant role of regulatory agencies, there is no doubt that the implementation of this standard will spread to private or unlisted companies, mutual funds, non-profit organizations, etc. While the capital markets in Asia have adapted to the new reporting standards very quickly and with minimal costs, the sophisticated XBRL taxonomies and business rules are mainly developed in the United States.

The United States implements a progressive and carefully documented approach in the implementation of XBRL. This is understandable, given that from the perspective of capital markets, the USA has much more technical and legal challenges to overcome than smaller countries. Moreover, the financial and reporting concepts based on *US GAAP* taxonomies are further aggregated by specific activities-industries, in contrast to the *IFRS* taxonomies that are more generic in terms of organization. While in the United States and Asia the

focus is more on the use of the XBRL standards in capital markets, Europe is focused on the development of cross-border projects and applications that enable a consistent exchange of structured XBRL data for public and private enterprises (Gilles, 2012).

Although the implementation of XBRL in South America is mostly on a voluntary basis for now, the increasing use of standards in the banking sectors and the capital markets will undoubtedly result in an increasing application.

4. IMPLEMENTATION OF XBRL IN MONTENEGRO– CHALLENGES AND OPPORTUNITIES

The implementation of quality financial reporting, as well as the possibility of implementing the XBRL standard for the exchange of business information include the review and assessment of the entire accounting profession, especially when it comes to the regulatory environment and financial reporting, as well as the competence of accountants and their organizations for the implementation of global standards for the exchange of business information. The base created by such analysis is unavoidable when testing the hypotheses set at the beginning of the research, as it clearly presents our current position and all the strengths, weaknesses, opportunities and risks.

Therefore, the institutional framework of financial reporting in Montenegro consists of legal, professional and internal accounting regulations.

4.2. Statutory accounting regulations in the context of the implementation of XBRL

There are several laws that adequately regulate the legal aspect of companies' accounting. Accordingly, the current legislative accounting regulations in Montenegro consist of the Company Law, the Law on Securities, the Law on Accounting and Auditing and the by-laws adopted on the basis thereof, different regulations, rulebooks and the like. The financial statements of companies and other entities in Montenegro would have to be standardized, internationally comparable and understandable to all the interested users.

However, we will leave these issues aside for now in order to analyze the aforementioned legal solutions in a generic sense, in terms of whether they recognize and define the global trends in terms of standardization of transfer and exchange of business information. In other words, the question is raised of whether the existing law on accounting and auditing and by-laws created on the basis of thereof provide a favorable regulatory framework in this regard, or represent a limiting factor in the context of implementation of the XBRL standard.

Bearing in mind that the emphasis is on the analysis of the legislative accounting regulations regarding the submission, publication and exchange of financial statements, in the following lines we will give an overview of the legal basis for these elements of financial reporting. Namely, the existing Law on Accounting and Auditing which regulates the issues of preparation and submission of financial statements provides that:

Legal entities are obliged to submit financial statements in paper and electronic form, no later than 31 March of the current year for the previous year.

Although it requires the submission of statements in an electronic form, it does not specify the format they are submitted in. As a result, information is "locked" into one-dimensional presentation formats (*Excel, Word, Web* forms, scanned documents, hard copies, etc.), which prevents their effective exchange and leads to inconsistency.

Moreover, the Draft Law on Accounting has not brought novelties with respect to the submission of financial statements. In this sense, it is proposed, as well as in the existing law, that:

> *The legal entity is obliged to submit the financial statements and the management report in paper and electronic form to the administrative body in charge of determination and collection of taxes (hereinafter: the Tax Administration) no later than 31 March of the current year for the previous year.*

To sum up, after reviewing the law on accounting and auditing and the proposed amendments, in the part referring to electronic reporting and submission of statements, it is obvious that the legislator and national standard establishers did not recognize the need for the standardization of financial reporting in terms of exchange of information. Since a standardized means of communication between regulators and companies, as well as between regulatory agencies has not been established, the companies must submit the same information and statements several times to different agencies, which not only requires additional resources but also diverts time and resources away from primary business activities. Although the appropriate regulatory agencies have launched a number of new approaches in electronic reporting with the aim of simplifying and automating the process of information exchange (Tax Administration of Montenegro, 2014, the Securities Commission, 2012), it should be noted that there is still no uniform approach to the development of infrastructure including software systems and uniform databases that would be available to different agencies, reducing the total costs at the state level.

Finally, there is no doubt that the harmonization of the law on accounting and auditing with the European Union Directives is expected in the coming period. It is also an occasion to improve the conditions for the application of new digital standards in new legal regulations and achieve some positive developments concerning the adoption and implementation of XBRL. The conducted analysis of legal accounting regulations regarding the electronic reporting represents only an initial step, but at the same time provides a framework which is very important because of the use of other rights provided by these legal regulations. Specifically, as the first step it should be anticipated and incorporated in legislation a possibility of submitting financial statements in a paper and electronic form or in prescribed forms or patterns that are formed through electronic messages, according to the XBRL standard, signed by a digital signature.

4.2. Professional accounting regulations in the context of the implementation of XBRL

Professional accounting regulatory framework consists of a set of national and international accounting principles, standards and codes of ethics. The fact is that more and more countries and their regulatory authorities opt for a consistent application of international professional regulations in the area of financial reporting. Hence, the commitments in the new legal accounting regulations of Montenegro are based on the mandatory application of International Accounting Standards (IAS) and International Financial Reporting Standards (IFRS). This will certainly make it possible to move closer to the preparation of our accounting practice for the application, preparation and presentation of better quality financial statements, and contribute to a faster integration of our economy, creation of a more favorable investment environment and increasing business confidence.

However, quality standards are not sufficient on their own. A major problem of their application remains. In this regard, numerous obstacles should be overcome, such as: the overcoming of different accounting traditions, improvement of the manner of the interpretation of standards, raising the level of education of professional accountants and their organizations.

Furthermore, in terms of professional accounting regulations in the context of implementation of XBRL in Montenegro, it is necessary to point out to a few additional, also relevant requirements and moments.

In the first place it is definitely the fact that, following the example of the world practice, the professional organizations would have a key role in the implementation of XBRL in Montenegro, such as the state has an important role by adopting the relevant and quality statutory accounting regulations. However, it seems that a number of measures should be undertaken by the legislator regarding the development of institutional environment for the implementation of professional regulations, as well as the division of responsibilities of the bodies for its implementation. Namely, the legislator has not made clear, nor has it clearly designated a professional organization - member of the International Federation of Accountants, whose right and duty is to implement the international professional regulations, adopt the national regulations and monitor their implementation. This is the reason for the lack of a comprehensive professional supervision and control of professional accountants.

Moreover, the lack of application of software and information standards is evident which hinders the implementation of advanced technological solutions. In a sense, the current legal arrangements represent a step backwards in terms of standardization of accounting software that are designed and produced for the purposes of bookkeeping, compilation and exchange of financial statements. It has already been pointed out that the first Yugoslav accounting standard dealing with accounting software was developed in early 1993, under the authority of Article 4 of the Law on Accounting (Official Gazette, FRY, no. 18/93), in relation to Article 12 of the same Law. On the basis of this law, the activities of standardization of accounting software were initiated, which led to a huge success in the process of design, production, application and quality of accounting software for the purposes of accounting coverage of data of different entities.

All this indicates that the previous legal regulations were reformist regarding these issues, as the valid solutions do not recognize the need for standardization of accounting software, which is important in the further process of standardization of accounting and information system and implementation of the XBRL standard. Hence, we believe that professional accounting organizations and regulatory bodies must undertake a number of activities in order to determine the framework for electronic bookkeeping and preparation of financial statements, regardless of the fact that the law makes no reference to it. After all, such solutions are increasingly represented in the countries with a developed information role of accounting.

Finally, it is also important to point out to the necessity of deregulation of legislative in favor of professional regulation, that is, the need to assign an important role to professional regulations in the regulation, which is not the case in Montenegro, at least when it comes to standardization of accounting information systems. Only in this way the legislative and administrative initiative is relieved and the professional solutions are enabled, without the influence of the current state economic policy. In this regard, one of the goals of this paper is focused on the direction of emphasizing the need for a clear commitment of the state that our financial reporting system moves towards the

standardization of financial reporting in terms of the exchange of business information, which would facilitate and improve financial reporting and also make a step forward towards global trends in the accounting industry.

In addition to the aforementioned, for a fuller understanding of the perspective of the implementation of XBRL in Montenegro, it is necessary to focus attention on a few additional issues, such as:

- sluggishness of the accounting profession in terms of accepting positive innovations in accounting, beyond the official "principal“ accounting;
- readiness of national standard establishers to accept the need for standardizing financial reporting with respect to the exchange of information
- perhaps the issues of the general level of required specialist, accounting and broader knowledge in the field of information technology,
- undeveloped management in our companies,
- most of the companies in Montenegro are small companies, to which XBRL will "remain invisible“ for some time. However, we believe that there is a need for the implementation of this standard even in small systems, which includes adequate argumentation that would result in additional research in this regard.
- and finally, the lack of awareness of the importance of XBRL.

Although the responses to the challenges focused in such a way cannot be easy, this paper could serve as a reference document, which is not only intended for professional creators of accounting information and regulators responsible for the adoption and implementation of standards, but also for other professional readers who are trying to understand the characteristics of this global standard that has completely redefined the accounting profession.

CONCLUSION

The considerations made about the possibility of implementation of the XBRL standard, aimed at improving the quality of financial reporting, leave a possibility to draw the following conclusions:

1. Development of communication and information technologies has enabled the relocation of financial reporting onto the Internet. As a result, today business information is available to everyone, in any place and at any time. For this purpose the international standard for the exchange of business information - XBRL is predominantly used today. This paper clearly indicates the advantages brought by the application of this standard to all participants in the chain of financial reporting.
2. The introduction of XBRL as a future standard of the exchange of business information in Montenegro would result in a number of business and social benefits, which have already been discussed. Moreover, the implementation of the XBRL standard at the level of state administration, modeled on the *SBR project,* would provide a more efficient exchange of business information and statements, and would significantly prevent "locking" and dependence of the state administration bodies (and other users) on a single product or software manufacturer. However, when designing the research study, we encountered various challenges given that XBRL has not been implemented in Montenegro so far. In this regard, we have looked at some of the most important implementations of XBRL globally, and clearly pointed to doubtless benefits brought by the application of this

standard. By generalizing the data obtained by the historical - comparative method, we pointed out the basic trends in the development and implementation of XBRL.

3. The conducted analysis of the institutional and regulatory framework has shown that the quality and availability of data are below the level of developed financial systems. Our current legal provisions do not provide for the need for standardization of accounting software that are designed and produced for bookkeeping, preparation and exchange of financial statements. Moreover, as regards the national level, it seems that one of the main challenges is the existence of more regulators with different levels of development and different standards regarding the submission of financial statements. In addition, our theoretical and technical literature in the field of accounting information system was not preoccupied with the issues of modern accounting information systems. However, as the implementation of XBRL becomes an unavoidable option, it is necessary to identify the critical factors - resources at the national level that are available and which may represent a starting point for the introduction of the XBRL standard. The changes in the philosophy of management and accountants are necessary, as well as new knowledge and skills. This is especially so considering that we have indicated that the application of the latest accounting - IT developments necessitate developed institutional and human resources capacity, and adequate preparation of accounting and governance structures.
4. Recognizing the mentioned limitations, we believe that XBRL can be successfully implemented in Montenegro. To support this statement, we pointed out to numerous assumptions, including: the consolidation of the financial sector (particularly banking), establishment of macroeconomic stability, computerization, and so on. In the last few years much has been done in the field of computerization and directing the state administration towards e-business and *Web* services.

   In this sense, as regards the micro level, a large number of business organizations today use some form of information system that can underpin the introduction of XBRL. Namely, today all major systems for business planning, such as *SAP*, *Navision* and others, have a built-in possibility of reporting through XBRL, which leads us to the conclusion that all major business systems in Montenegro, which use some of the ERPs have a foundation for the implementation of XBRL at the level of business organization. Understandably, it immediately raises the issue of small legal entities, which make up, just to remind ourselves, 98.70% in Montenegro, (Monstat, 2012), and which clearly have some specific features that affect the process of implementation. This applies in particular to differences regarding: the available resources (human and material), the speed of the implementation process, the system of project planning and management, information requirements in relation to the system and so on. However, the answer to this question is, as in the previous case, very easy. Namely, different software manufacturers now offer very simple solutions that are based on the XBRL add-ons for the Microsoft Excel and Word, which are now used by most businesses. Understandably, in both cases these processes are preceded by the adoption and adaptation of relevant legal and professional accounting regulations in Montenegro.

   All this leads to the conclusion that, taking into account the above restrictions, there is a basis for the introduction of the XBRL standard, both at the level of regulatory agencies and business organizations, while the possibility and speed of implementation largely depend on their technological status. Namely, computerized companies, which enable free internet access to their employees, and which have the staff trained in IT will make a more painless transition to the new reporting system. Based on the results of research initiated

by the Securities Commission (http://www.monstat.org/userfiles/file/registri.pdf), it can be concluded that there will be a lot of work in this regard, since 30.70 % of the surveyed companies do not have a website, while out of those businesses that have a website only 42.30% post their documents on it. The fact that the surveyed companies pay little attention to communication via the Internet is confirmed by the data relating to the existence and updating of the Web pages. Namely, 34.5% of companies have a bilingual site (our and a version in English), while, on the other hand, 32.5% have no version in English.

5. Finally, it is necessary to add that, paradoxically, we find ourselves now in a fairly favourable situation because the underdeveloped systems can be adapted almost immediately to the latest standards and trends. The same is the case with the training of the personnel.

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PRIMJENA XBRL-A U FUNKCIJI UNAPREĐENJA KVALITETA FINANSIJSKOG IZVEŠTAVANJA U CRNOJ GORI

Računovodstvena profesija, nakon više od vijeka duge i uspješne istorije pružanja računovodstvenih i revizorskih usluga, suočava se sa mnogobrojnim izazovima i mogućnostima u XXI vijeku. Paralelno sa razvojem novih tehnologija, organizacionih rješenja i uspostavljanjem standarda finansijskog izvještavanja, u poslednjoj deceniji evidentna je snažna ekspanzija softverskih alata za razmjenu poslovnih informacija.

*Krajem devedesetih godina prošlog vijeka, pojavio se e**X**tensible **B**usiness **R**eporting **L**anguage – XBRL, koji predstavlja jednu od najznačajnijih tehnoloških inovacija u finansijskom izvještavanju, prikupljanju i razmjeni podataka još od pojave elektronskih tabelarnih prikaza.*

U tom smislu, cilj ovoga rada jeste da izvrši procjenu XBRL-a u funkciji unapređenja kvaliteta finansijskog izvještavanja, ističući kako pozitivne tako i negativne aspekte ovog standarda za razmjenu poslovnih informacija.

No, iako je XBRL standard globalno prihvaćen, te se dokazao kao svojevrsni evergrin - koji po mnogima obećava revoluciju u finansijskom izvještavanju i razmjeni poslovnih informacija - činjenica je da implementacija ovog standarda još uvijek nije zaživjela u Crnoj Gori i u regionu. Otuda, jedan od ciljeva ovog rada jeste i da ukaže na odnos uzajamnosti između primjene XBRL standarda u računovodstvenoj praksi sa nivoom razvijenosti računovodstvene regulative, edukacijom profesionalnih računovođa i spremnošću nacionalnih uspostavljača standarda da prihvate potrebu za standardizovanjem finansijskog izvještavanja u pogledu razmjene informacija.

Dakle, sve ovo smo naveli kako bismo jasno ukazali da se radi o velikom naučnom izazovu da se jedno novo i za naše uslove još uvijek neistraženo područje osvijetli sa aspekta primjene savremenih metoda računovodstvene teorije i prakse. U tom kontekstu će biti veoma interesantno fokusirati se na Crnu Goru, koja ide u pravcu evroatlanskih integracija, i koja je do sada imala prilike da se sretne sa brojnim institucionalnim i regulatornim problemima koji su na određeni način dovodili u sumnju upotrebnu vrijednost finansijskog izvještavanja.

Ključne riječi: *XBRL, finansijsko izvještavanje, Internet, preduzeće, računovodstveni standardi, regulativa, stejkholderi, globalizacija.*

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CONTRIBUTION OF INTERNAL AUDIT IN THE FIGHT AGAINST FRAUD

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Abstract. *The constant increase in the volume of fraud, which leaves devastating effects on business performance, causes a significant preoccupation of enterprises with this problem. Being aware of the fact that the establishment of an adequate fraud risk management process is necessity, enterprises are increasingly basing the effectiveness of the mentioned process on the potentials of internal audit. Bearing in mind that internal audit does not have the primary responsibility to prevent and detect fraud, its integration in fraud risk management process represents a new challenge for this function. In the paper, authors initially point out the factors that determine the ability of the internal audit to fight against fraud, then the contribution that this function can provide in its prevention, detection and investigation*.

Key words: *Internal audit, fraud risk management, fraud prevention, fraud detection, fraud investigation.*

INTRODUCTION

Frauds stand for the risk that no company can fully eliminate. Aware of this, companies are making significant efforts to establish an effective fraud risk management process, in order to minimize and mitigate its multiple negative consequences. In addition to defining the roles and responsibilities of the audit board, management, and committee, as primarily responsible participants in this process, companies increasingly rely on the strength of internal audit.

Increased expectations from internal audit in the fight against fraud arise from the fact that it is a function which, focused on creating added value for the company, knows all its processes and activities. Indeed, through the proper implementation of its tasks and activities, internal audit can actually greatly contribute to the prevention and detection of fraud. However, it often happens that internal audit is given the responsibilities which it does not have and cannot have. In addition, professional regulations covering internal

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audit provide for the liability of internal auditors to detect the risk of fraud which the company is exposed to, as well as the way in which the company manages these risks, but do not specify the tasks of internal audit in this process.

Possibilities and expectations from internal audit as regards effective defence of the company against fraud, on the one hand, and insufficiently precise regulation of its responsibilities in this part, on the other hand, are the reason for reviewing the scope of internal audit in this area. What are the conditions under which the internal audit provides support and security to the board of directors and management that the likelihood of fraud is minimized and is internal audit up to this challenge are the questions whose answers affect the further development of this profession in the field of fraud risk management.

1. RISKS OF FRAUD IN COMPANIES' OPERATIONS

Fraud is not a recent phenomenon. Even the earliest human history recorded cases of using tricks, various forms of manipulation, and deception, in order to acquire some benefit: land, goods, money, some form of profit, or even someone's trust [23, 490]. Thus, with the advent of organized performance of economic activity, fraud has become a serious threat, to which the business of each company is exposed. This includes a wide range of irregular and illegal activities: deception, bribery, intentional concealment of events or information, forgery, giving false information, concealment of material facts, theft, misuse of funds or other resources, and the like. The Association of Certified Fraud Examiners (ACFE) classifies all these forms of fraud into three broad groups: (1) manipulation in the financial reporting, (2) misuse of tangible and intangible assets of the company, and (3) corruption. The variety of forms of fraud is one of the reasons why there is no single definition of this category today. Thus, the Institute of Internal Auditors (IIA) defines fraud as "any illegal act characterized by deceit, concealment, or violation of trust. These actions are not dependent upon the threat of violence or physical force. Fraud is perpetrated by persons and organizations to obtain money, property, or services; to avoid payment or loss of services; or to secure personal or business advantage" [27]. "Fraud is any intentional act or omission designed to deceive others, resulting in the victim suffering a loss and/or the perpetrator achieving a gain" [25, 5]. ACFE sees fraud as "the use of one's occupation for personal enrichment through the deliberate misuse or misapplication of the employing organization's resources or assets" [2, 6]. "In a more complex definition, fraud can be accomplished by any person that aims to obtain a certain gain or cause a certain loss, or even to expose others to risk in a dishonest manner" [16].

Approaches to determine fraud are different. However, each of these definitions suggests that fraud can be committed by all employees in the company, regardless of their hierarchical level, as well as persons outside the company. In this regard, studies have shown that the three key factors, or conditions, determine the probability that fraud will be made, which is known as the Triangle of Fraud:

- The existence of pressure, i.e. stimulus – financial benefit, i.e. money is the most frequent motive for committing fraud. However, fraud is often committed to preserve the workplace, achieve a prestigious position, and advance in career. Company managers are often willing to commit fraud, in order to preserve profitability and positive trends, in line with the expectations of investment analysts, investors, significant creditors, or other persons, and in order to secure new sources of funding.

- The existence of opportunities, i.e. circumstances, which allow the perpetrator to find a way to commit fraud. These opportunities are determined by the position of the individual, the position of some close influential people in the company, inadequate division of tasks, the lack or weakness of existing controls, the lack of well-defined punitive measures, etc., and
- The possibility of rationalization, i.e. providing justification for the committed actions. Specifically, individuals will not commit fraud if it cannot be justified as the process consistent with their ethical behaviour [13, 354]. This particularly refers to: interest of the management to preserve or increase the stock price or earnings trend, the achievement of financial targets of the company, etc.

Regardless of the different definitions aimed at clear determination of fraud, and despite the different motives, opportunities, and possibilities of justification of fraudulent behaviour, consequences which fraud brings about are the same – the loss of value for stakeholders of the company. Apart from the financial losses, which are very important, fraud inflicts much greater damage by distorting labour productivity in the company, compromising its reputation, social responsibility, the negative impact on the image, the destruction of investor confidence, lowering the credit rating, etc. Looking beyond, fraud adversely affects the economy of a country as a whole, causing major financial losses, weakening the social stability, endangering the democratic structures, reducing confidence in the economic system, and compromising economic and social institutions.

Study of the problems of fraud, in terms of timely recognition and perception, consideration of possible consequences, and the establishment of mechanisms to prevent them, is a very complex task. In addition to the precise determination of fraud, in terms of establishment of the criteria for the recognition of its origin, it is necessary to adequately recognize the aspects of the risk of fraud: the position of the manager, the complicity between employees, inadequate division of tasks, unauthorized handling of company resources, conflict of interest, inappropriate storage of documents, and the like [23, 492]. It is also necessary to take into account the overall economic, legal, criminological, psychological, and sociological aspects and relations [14, 326]. The gravity of this problem has particularly come to the fore with the growing complexity of business methods, the characteristics of the modern business environment, and the development and implementation of methods of committing fraud under the influence of the information technology progress. This is confirmed by large, well-known financial scandals of the late 20^{th} and early 21^{st} century, linked to the companies Enron, Waste Management, World Com, and others. The consequences of these cases of fraud were fatal: the collapse of companies, large investment losses, significant litigation costs, erosion of confidence in the capital market, and others.

These events have certainly raised awareness of the importance of strengthening the mechanisms for combating fraud. However, unfortunately, the fact is that, today, fraud is one of the most important business risks which the companies are exposed to. This is supported by the continuous annual surveys by ACFE, which monitors the effect of fraud on the world economy. The latest report [2], published in 2014, which included 1,483 cases of fraud in commercial companies, financial institutions, government institutions and agencies, non-profit organizations, etc. in more than hundred countries of the world, contains alarming data. Specifically, the results indicate that the typical company loses on average 5% of its total revenue due to fraud committed by employees, which, compared to the gross world product, is as much as 3.7 trillion US dollars. The largest number of acts of

fraud related to the misuse of funds, in 85% of cases, while corruption was observed in 37% of cases, and 9% related to the manipulation of the financial statements. However, despite the presented relative amounts, in absolute values, loss due to misuse of funds amounted to 130,000 US dollars, corruption to 200,000, while manipulations of the financial statements made a loss of as much as 1,000,000 US dollars. These results immediately suggest that, in many cases, there are more categories of fraud. On average, 30% of the schemes involve two or more forms of fraud. The interesting part of this study concerns the relation between the hierarchical position of the perpetrator and a number of committed acts of fraud. The obtained results show that, out of the total number of acts of fraud, 19% were committed by senior managers and owners, 36% by mid-level managers, and 42% by employees. However, although the number of acts of fraud committed by employees is far greater than the number of cases of fraud committed by mid-level managers, the damage caused in this way is two times less than the damage committed by mid-level managers, which is, in turn, three times less than the damage made by senior managers and business owners. This confirms the fact that the possibility of committing fraud and the seriousness of its consequences are, in fact, determined by the availability of resources to perpetrators [13, 354].

Recognizing this situation, which has been present for years, company investors, the public, and other stakeholders significantly lose confidence in the management of the company and the way they manage, and become more sensitive to the problems that occur as a result of fraud. In response to this, they expect the company to take a position of "zero tolerance to fraud" [25, 5], and to establish mechanisms aimed at preventing and detecting fraud, i.e. fraud risk management. In this regard, companies need to establish an adequate framework, i.e. fraud risk management program, which involves proper definition of policies that include expectations of the board of directors and management in relation to risk management. Providing such a program involves clear setting and understanding of the roles and responsibilities of all persons in the company, at all hierarchical levels, to be achieved by establishing policies, job descriptions, rules of work, delegation of authority, etc.

Adequately established fraud risk management process involves, first, periodic ***assessment of fraud risk exposure***, in order to identify potential events whose occurrence the company should prevent. In this regard, IIA suggests that the company should: identify relevant fraud risk factors, potential fraud schemes and rank them based on the probability of their occurrence, map existing controls and identify the existence of gaps, test the effectiveness of controls aimed at preventing and detecting fraud, and document and report on the completed risk assessment. On this basis, it is necessary to ***establish preventive mechanisms***, in order to avoid potential risk events and mitigate possible negative consequences for the company. Although the company can never minimize the risk of fraud to zero, the establishment of mechanisms and activities, aimed at preventing fraud and reducing the negative consequences, is of great importance. The basis of good prevention of fraud, above all, lies in raising the awareness of all employees on the established fraud risk management process, communication of efforts aimed at preventing the occurrence of fraud, and the possibility of starting potential disciplinary and criminal proceedings against the perpetrators. ***Establishment of fraud detection techniques*** is done in cases when preventive measures have not yielded a result, i.e. when the fraud occurred. In this respect, companies rely on techniques aimed at recognizing the signs of occurrence of fraud, and they, as such, must be flexible and adaptable to variable risk environment. Finally, ***establishment of a coordinated process of investigating fraud*** is aimed at revealing the nature and extent of fraudulent activity, and involves performing

procedures to obtain information and specific details that would indicate whether the fraud occurred, the loss which the company is exposed to due to fraud, persons involved in the fraud, and the way in which the fraud occurred.

The fact is that some cases of fraud are difficult to prevent, because they are carried out in collusion, with careful removal of evidence. However, well-designed and consistently applied procedures of fraud risk management may in a number of cases deter people who have the ability to commit fraud [29, 12].

2. Effectiveness of Internal Audit in Fraud Risk Management

At today's level of development, internal audit is a key participant in the system of corporate governance. By introducing a systematic and disciplined approach, internal audit is aimed at supporting and strengthening the mechanisms of company management, as well as assessing and improving the effectiveness of risk management and control processes [28]. More specifically, internal audit is expected to be focused on assessing the risks that could adversely affect the organization, as well as on the establishment of a mechanism that will monitor and control that risk, with a view to its elimination, or, at least, reduction [9, 354]. This role of internal audit means that it is a function that knows all the processes in the company, the risks to which the company is exposed, and internal control and the persons who carry out this control, which is why its potential and ability to achieve high effectiveness in preventing and detecting fraud is recognized. In this respect, the IIA Standards oblige internal audit to, "in determining the objectives of its engagement, assess and take into account the potential possibility of fraud" (ISPPIA 2210.A2) and "...assess the way in which the company manages the risk of fraud" (ISPPIA 2120.A1). For these reasons, today, the companies increasingly focus their programs, aimed at reducing fraud, on internal audit, which is seen as the first line of defence, i.e. significant management tool that ensures the protection of the company from internal criminal behaviour [22]. The expectations that are put before internal audit are related to the investigation of [10, 276]:

1. Attitude of the highest level company management towards risk,
2. Risk management strategy – how risks are treated in different areas of the company, whether the risks are embedded in the company, ignored, accepted, minimized, or eliminated,
3. The general attitude on risk management – whether risks are embedded within the entire business process of the company or built into a business process of certain areas,
4. The attitude of the environment towards risk and control,
5. Whether there are written policies and measures that prohibit the violation of company goals in the fight against fraud,
6. Whether specific procedures of authorization for certain transactions are established and respected,
7. Whether the mechanisms for monitoring the activities and safeguarding the property are established, particularly in high-risk areas,
8. Whether the information system works in such a way that it provides the management with credible and reliable information, and
9. Whether the recommendations of the internal audit, with regard to establishing a control system in the fight against fraud, are respected.

Internal auditors can realize the thus defined expectations, according to the Recommendation 1210A2-1, by considering the elements of the COSO framework: control environment, risk assessment, control activities, information, and communication and monitoring. Example of good practice of the use of COSO components is the program framework aimed at preventing fraud, developed in the company Hewlett-Packard (Figure 1).

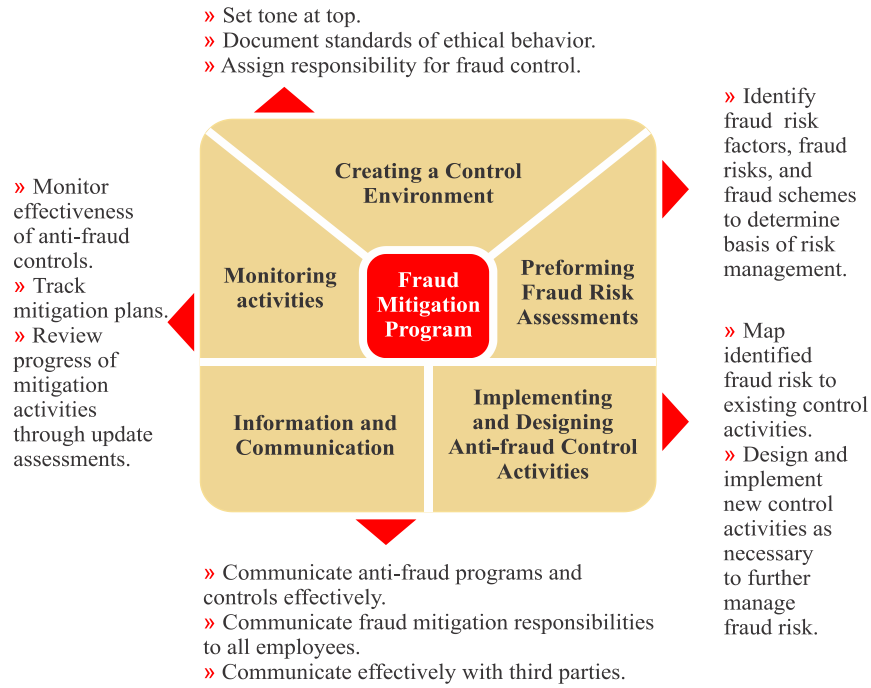

Fig. 1 The Fraud Mitigation Program Framework
[17, 49]

However, despite the obvious great potential of the internal audit to prevent and detect fraud, and, in that regard, the expectations that have been placed before it, the question arises as to how much internal auditors are actually really up to the challenge in practice. The question arises because the Standard 1210.A2 itself stipulates that "internal auditors must have sufficient knowledge to assess the risk of fraud and the way in which the company manages that risk, *but they are not expected to have a level of expertise as the person whose primary responsibility is detecting and investigating fraud*". So, with twelve years of experience in this profession, Hodge [12] recognizes that, in some cases, internal auditors have not adequately responded to this task. In her view, the problem resides in the fact that internal auditors do not really understand what it means to incorporate the understanding of the risk of fraud into their work, not in the fact that they are incompetent, negligent, or that there is some other reason why they are not able to contribute to the prevention and detection of fraud. Some auditors interpret the Standard

requirements in the sense that they do not have too much responsibility to prevent and detect fraud – they are not required to be fraud investigators, while others are convinced that they possess the required knowledge, while reality is actually the opposite. Based on her own experience, Hodge further states that the understanding of the fraud risks is the individual responsibility of each auditor, which is why they should constantly bear in mind their role in managing the risk of fraud, and continually increase their knowledge about ways of preventing and detecting fraud.

A similar attitude was taken by DeZoort [8] indicating that the level of responsibilities of internal auditors in preventing and detecting fraud is, in fact, determined by their perception of the responsibility they should have. Starting from the model of the triangle, first applied by Schlenker et al. (1994), DeZoort investigated the effect of different types of fraud (manipulation in financial statements, misuse of funds, and corruption) and the professional obligation of application of standards on the internal auditor's responsibility to prevent and detect fraud. According to the triangle model, personal responsibility of internal auditors is conditioned by the extent to which an individual: (1) has a clear, well-defined set of regulations (standards, rules, policies...), (2) feels a professional obligation, and (3) feels the connection with the event by controlling it (there is an intention and possibility to establish and apply specific measures as regards perpetrators). Starting from this model, results obtained by DeZoort indicate that internal auditors show a higher degree of responsibility for the prevention and detection of fraud relating to the misuse of funds in relation to fraud related to the financial reporting process and corruption. So, although the Standards of internal audit do not distinguish between types of fraud that internal auditors should pay attention to, their perception of possibility to control misuse of funds is perhaps the most pronounced. In addition, the study results point to the position of internal auditors, based on which the highest degree of responsibility for detecting fraud should be in the hands of the company bodies, rather than the bodies outside of it (for example, external audit). However, at the same time, internal auditors hold the position that the highest professional responsibility belongs to the company management, accountants, and then the internal auditors.

Bearing in mind that the effectiveness of internal audit is largely determined by the auditor's personal attitude, knowledge, skills, etc., there are a number of seminars, workshops, and conferences nowadays, which emphasize the need for improvement of internal auditors in this area. More specifically, the internal auditors are expected to: (1) become familiar with the work of the specific part or process that is audited, in connection with possible acts of fraud, characteristic of the subject of audit; (2) in work always apply professional scepticism, i.e. deeper examination and critical evaluation of the findings, starting from the assumption that managers or employees are neither honest nor dishonest. This is a priority because the inadequate observance of the principle of professional skepticism is cited as the most common cause of failing to detect fraud [26, 14]; (3) understand fraud and the risk of irregularities in the work, i.e. know the fraud schemes and techniques that are used, as this allows them to promptly detect red flags (indicators) that the fraud was committed or may be committed; (4) be able to adequately assess the likelihood of fraud risk, i.e. its identification and ranking, based on the impact on the achievement of company goals; (5) apply the brainstorming, which, without increasing costs due to the interaction between the auditors in a group, can maximize the generation of ideas on fraud, which inevitably contributes to improving the effectiveness and efficiency of internal audit [7]. Although the idea of brainstorming application in internal audit has not gained momentum until the early

2000s, it is believed that, today, "this procedure should be an integral part of a proactive approach of internal auditing in detecting fraud" [18, 67].

Despite the efforts that the internal auditors need to make, for the purpose of improving their effectiveness in fighting fraud, great support must be provided by the companies in which they operate, in a way to enable them to [11, 69-70]:

- Align their actions with the priorities and goals of the company, both in the long and in the short term. Internal auditors will achieve this by becoming familiar with: the way in which management undertakes to respect ethics and incorporate mechanisms of compliance with regulations in the objectives, strategies, decision-making, and daily operations of the company; the methods used by management to promote and improve the integrity and ethics, and compliance with the core values of the company; the specific policies, programs, and control of compliance; possible responses to the challenges of implementing ethics and compliance activities, etc.
- Gain support from the board of directors and senior management in terms of establishing clear objectives, clear reporting lines and line of responsibility, allocating the necessary resources (human and material), obtaining input in planning, establishing processes for monitoring the success of implemented activities, and the like.
- Design an adequate process of reporting on the results of the work, which will ensure effective and efficient communication with relevant stakeholders, and specify structure of the report, which is essential for proper interpretation of the findings.

Although the issue of effectiveness of internal audit in fraud risk management is fully justified, many studies show that the internal audit is up to this challenge. This is confirmed by the results of research conducted by Monisola et al. [19] and Coram et al. [6], indicating that, in the companies with the established internal audit function, much more acts of fraud are detected, in relation to the companies in which internal audit is not functioning. Furthermore, research carried out by ACFE in 2014 indicates that about 14.1% acts of fraud were initially detected by internal audit, which is more in relation to accounting (6.6%), examination of documents (4.2%), external auditing (3%), monitoring activities (2.6%), IT control (1.1%), and others. Internal audit is actually seen as a proactive mechanism that is able to quickly "catch" fraud and greatly minimize its negative consequences.

3. POWERS AND RESPONSIBILITIES OF INTERNAL AUDIT IN THE FIGHT AGAINST FRAUD

Comprehensive knowledge and understanding of the risks of fraud allow internal audit to adequately specify its tasks, objectives, and activities, focused on fraud risk assessment, prevention and detection of fraud, and, ultimately, investigation of fraud. In this way, internal audit significantly improves the process of fraud risk management, and its unique position enables it to support other stakeholders in this process – the board of directors, audit committee, management, and employees, by [3]:

- Providing assurance about the effectiveness of fraud risk management and internal control processes,
- Providing advice in defining fraud risk management strategy,
- Providing advice on the possibilities of improving fraud risk management and internal control processes in the company.

As regards the power of internal auditing in the fight against fraud, it in the first place refers to its activities within the framework of a ***fraud risk assessment*** process, which involves identification of where, how, and who can commit fraud in the company. Internal audit activities in this process are aimed at:

- *Identification of relevant risk factors*, where the internal audit collects information about the activities and processes of the company, in order to be able to identify areas of potential fraud. The techniques used in this process include: oral interviews with management and employees, questionnaires, and, most often, the use of the already mentioned, "fraud triangle" technique [21, 16-17]. In this way, the auditors identify areas where there are possibilities of occurrence of fraud, i.e. persons who have the motive, the opportunity, and the possibility of rationalizing the possibly committed fraud. In cases of identifying the presence of some of the factors, internal audit examines what could be the subject of fraud, and how fraud could be done, i.e. identifies possible fraud schemes.
- *Ranking the fraud risk* in relation to the estimated amount of loss and the likelihood of fraud. Loss, i.e. damage, which may occur in the form of cash loss, decline in reputation, decreased productivity, loss of resources, reduction in liquidity of assets, etc., is difficult to assess. For these reasons, internal auditors largely rely on their experience, and rank loss in respect of a given period of time, expressed in cash units, for certain intervals of likelihood of occurrence. On the other hand, the likelihood of occurrence is mainly based on fraud triangle: where all the factors are present (motive, opportunity, and rationalization), the likelihood of fraud is higher, and vice versa.
- *Mapping and testing of existing internal control mechanisms* – internal auditors first identify the control mechanisms established by the company, directed towards the prevention and detection of fraud in the company. In this regard, they compare them with potential fraud schemes, all in order to identify the existence of a possible gap. In addition, internal audit carries out in particular the evaluation of effectiveness, because the existence of internal control does not mean at the same time certain protection from fraud occurrence, which subsequently affects the likelihood of risk which internal audit will assess, and
- *Documenting and reporting on the assessed risk*, which internal auditors are obliged to do, based on ISPPIA 2060. Key elements of the report, of benefit to the company management, include [26, 18]: types of fraud that have a chance to appear, the inherent risk of fraud, the adequacy of the established anti-fraud and internal control programs, the potential gap between the established control mechanisms, the likelihood of significant fraud, the possible impact of fraud on the company's operations.

After risk assessment, internal audit directs its activities to the **prevention of fraud occurrence**, and limiting the negative impact of fraud that occurred. These activities are largely focused on providing assistance to the company management, which is primarily responsible for the establishment of mechanisms to defend the company against fraud. In fulfilling this responsibility, internal audit determines:

- Whether the company has created an atmosphere that raises awareness about the existence and importance of control mechanisms,
- The existence of a written policy (for example, a code of ethics), which describes the prohibited activities and measures to be taken if the violation is discovered,

- The adequacy of established policies relating to the transaction authorization,
- The existence of policies, procedures, practices, and other mechanisms for the monitoring of activities and the protection of resources, particularly in high-risk areas,
- The effectiveness of communication channels, in terms of providing adequate and reliable information to the management, and
- The need to provide recommendations for the establishment and improvement of control mechanisms, to prevent fraud in the company [20, 581].

In addition to providing support, internal audit can conduct activities that are directly aimed at preventing fraud. Some of them are: constant analytical reviews, review of contracts in the company, creation of power rotation programs in the company, assessment of the electronic data protection system, conducting surprise audits, monitoring of failed attempts to access the computer, and others [1].

The fact is that even the best mechanisms established to combat fraud do not guarantee that fraud will not occur, which is why the internal audit specifies its tasks and activities in **detecting fraud**. The degree of success of recognizing fraud red flags (indicators) is determined by the good knowledge of the fraud schemes, and, according to Joan [15, 27], in particular, by the ability of internal auditors to think as perpetrators of fraud. In detecting fraud, internal auditors use different methods: statistical, mathematical, interviews, etc., all of which need to be flexible and adaptable to risk areas [26, 21]. Table 1 presents the most commonly used methods of internal audit, depending on the type of fraud.

Table 1 The most commonly used methods of internal audit in detecting fraud

Type of fraud	Procedures of internal audit
Manipulation in the financial reporting	inventory observation, cut-off tests, tracing to supporting documents and reconciliations internal control reviews review of separation of duties, control monitoring, reviews of employees that had access to various accounts analytical review for period to period revenues and costs, changes between accounts and reasonableness of estimates
Misuse of assets of the company	cut-off testing, reconciliations, scan accounts for unusual items, review of wire transfers, physical inventories review of controls such as tip hotlines, segregation of duties, treasury transactions, approvals of accounts payable, and management review of work of lower level people.
Corruption	review of internal controls around the segregation of duties, auditing employees' expense reports, reviewing company policies and following up filed complaints, analytical procedures and risk assessment techniques, look for weaknesses in internal controls, performed audit tests and in-depth audits. review the whistleblower policy and tips submitted to a hotline

Source: adapted from [4]

After detection, fraud needs to be explored further – by collecting data through observation, interviews, or written statements, with the aim of determining the nature of fraud, i.e. determining areas of fraud and techniques used, estimating the causes of fraud, identifying perpetrators, and assessing the consequences. The role of internal audit in this process may be different [26, 23]:

- To have the primary responsibility in investigating fraud,
- To serve as a significant source of information, and
- To have no role in this process.

Which one of these roles internal audit will have depends on many factors. Specifically, even though the traditional internal audit activities are not directed to investigating fraud, internal auditors are increasingly expected to meet and adopt **techniques and methods of forensic investigators**. Greater involvement of internal audit in detecting fraud includes [24, 47-48] that this function has a high degree of **independence** – actual and factual, in order to freely investigate fraud. Next, **knowledge of different types of fraud and associated schemes** is needed. Bearing in mind that most of the identified schemes are linked to the misuse in the process of financial reporting, internal auditors are specifically required to possess the **knowledge of accounting**. Possession of **interviewing skills** stands out in particular, because knowing which question to ask, and, more importantly, in which way, is determined by the importance of the information they want to collect [15, 30]. **Knowledge of IT technology and the skills of collecting and analysing electronic information** (e-mail, files, etc.) are now the key requirements, considering that lack of knowledge or poor handling of electronic data can cause their irrevocable destruction. Finally, entrusting the role of fraud investigator to internal audit involves the possibility that the work will be examined by the regulatory bodies. Therefore, notes, working papers, work schedules, and other documents that reflect the internal audit activities must be **consistent with regulatory requirements**.

A well-established team of internal auditors, who meet the above-mentioned conditions, largely ensures success in fraud investigation. In addition, companies realize significant cost savings by avoiding hiring forensic investigators, specialized law firms, or other bodies that provide professional services of this type. However, adequate assessment of the audit team with respect to the possession of skills, resources, and other issues, is very important, because the costs of poor investigation can several times exceed the costs of hiring well-qualified external investigators.

CONCLUSION

With a devastating effect on the profitability, productivity, social responsibility, and reputation of the company, fraud is one of the most significant risks that companies face. Although it is clear that even the best established programs and mechanisms cannot provide a guarantee that fraud will not occur, the internal audit is the function from which much is expected in this regard. It is completely logical, given that, by directing its activities towards providing assurance on the effectiveness of all processes in the company and their improvement, internal audit cooperates with everyone in the company, which gives it the ideal position to take a proactive approach to reducing the risk of fraudulent behaviour of employees.

IIA emphasizes the importance of internal audit in the fight against fraud, by appropriate standardization and closer determination of the role of internal audit through practical guides. However, the above-mentioned regulations do not specify the tasks and responsibilities of internal audit, which points to the conclusion that its effectiveness depends on the support it receives from the company in which it functions, and, especially, on the knowledge, skills, and personal responsibility of internal auditors. In this regard, well-organized internal audit, consisting of independent internal auditors, for whom the application of professional scepticism is an imperative, and who feel the responsibility of continuous improvement of knowledge on fraud, can significantly reduce the risk of fraud. This is achieved by providing opinions on the adequacy and effectiveness of fraud risk management strategies, fraud prevention and detection, fraud risk assessment, consideration of potential cases of fraud during each audit, identification of fraud indicators, monitoring and identification of systemic weaknesses and missing internal control mechanisms, fraud investigation according to the knowledge and expertise of the members of the team, reporting to the board and management on the activities conducted in relation to the detection and prevention of fraud, etc.

Through the adequate implementation of the above activities, internal audit is able to respond to the increased expectations of company stakeholders and justify the trust placed in it.

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DOPRINOS INTERNE REVIZIJE U BORBI PROTIV PREVARA

Konstatni porast obima prevara, koje ostavljaju razorne posledice na uspešnost poslovanja, uslovljava značajnu zaokupljenost preduzeća ovim problemom. Svesna činjenice da je uspostavljaje adekvatnog procesa upravljanja rizikom prevare nužnost, preduzeća u sve većoj meri efektivnost pomenutog procesa baziraju na potencijalima interne revizije. Imajući u vidu da interna revizija nema primarnu odgovornost u sprečavanju i otkrivanju prevara njeno integrisanje u proces upravljanja rizikom prevara predstavlja novi izazov za ovu funkciju. U radu autori najpre ukazuju na faktore koji opredeljuju mogućnost interne revizije da se bori protiv prevara, a onda i doprinos koji ova funkcija može da pruži u njihovom sprečavanju, otkrivanju i istraživanju.

Ključne reči: *Interna revizija, upravljanje rizikom prevara, sprečavanje prevara, otkrivanje prevara, istraživanje prevara.*

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ANALYSIS OF THE DEGREE OF APPLICATION OF ELECTRONIC AND MOBILE TRADE IN AIRLINES SECTOR

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Abstract. *In this paper, the authors study and analyze the degree of application of electronic and mobile commerce in the airlines sector, arguing that modern information and communication technologies provide a powerful tool for airlines and can significantly affect their operations, structure and strategy. In the airlines sector, the Internet is considered to be the most important technological revolution, because upon its appearance the booking systems ceased to be passive computer archives and records and become active operating systems that transform the air traffic with immense speed. In the mid-80s, specific types of information systems appeared and these were global distribution systems which were designed for the distribution of tourism products, whose implementation on the website gave airlines access to electronic trading and enabled them to carry out the provision of services and conduct the sale of air tickets on the Internet. However, the development of technology, the appearance of smart phones and numerous other factors today necessitate airlines to access mobile commerce and make their services available to smart phone users as well as on the website.*

Key words: *ICT in airlines sector, online reservations of air tickets, mobile commerce in airlines sector, global distribution system.*

INTRODUCTION

Airlines are among the first ones that realized the importance of investing in information technology due to the complexity of their business. These companies have played a major role in the initial development and diffusion of new technologies.

In the air traffic, the Internet is referred to as the most important modern revolution during which the booking systems cease to be passive computer archives and records and become active operating systems which transform air traffic with immense speed.

The Internet is the means (channel) through which information is transmitted and exchanged in the best and fastest way. It has completely changed the way of doing business

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and it has brought down geographical boundaries, language barriers and currency restrictions. It enables simple and fast communication, the transmission of large amounts of data over long distances, easy publishing and updating of multimedia documents and their continuous availability, digital delivery of goods and services, the creation of virtual organizations.

Through expanded use of the Internet, airlines are able to reduce labor costs and eliminate commissions in some cases (Adee, 2002).

Increasing demands of buyers of services in air traffic has led to radical changes in the distribution of airline services. Before the Internet boom, airlines were relying on the agents who were selling and booking air tickets in order to sell airline tickets, and now they are able to sell and distribute air tickets through their own websites using the computerized reservation systems. These customer requirements, as well as travel agencies, led to the development of the global distribution system that connects certain computerized reservation systems with airline companies and besides the main activity distribution of airline flights serve as distribution systems for hotels, rent-a-car companies and companies dealing with cruises.

1. ELECTRONIC COMMERCE IN AIRLINES SECTOR

The emergence of electronic commerce created fundamental changes in the way the work gets done. Unlike traditional market, electronic market has a neutral intermediary role between the buyer and the seller. The electronic market is a virtual place where buyers and sellers meet in order to exchange goods and services. This market uses Internet technologies and standards for the distribution of products and the performance of online transactions. Traditional market is different from electronic market mainly because of the reduction of entry barriers and the ability to search and obtain information about products and services.

Electronic commerce can be defined in different ways. Any definition of the concept helps to better explain and understand, and some of the definitions are:

Electronic commerce is digitally enabled commercial transactions between organizations and individuals (Schneider, 2002).

Also, e-commerce, according to other authors, is defined as a new concept that is being developed and that includes the process of buying and selling or exchange of products, services and information via computer networks, including the Internet (Wen et al, 2001).

E-commerce is the use of electronic communication and digital information processing technology in the business purpose for the creation, transformation and redefinition of relations in the value creation between organizations or between organizations and individuals (Turban, 2000).

Electronic commerce is a trade activity performed using electronic technology, and includes the purchase and sale of products, services and information over the network (Bjelic, 2000).

Electronic commerce is not limited to buying and selling products, but also covers all pre-sales and post-sales activities along the supply chain (Kim et al. 2002). Based on the above, two general advantages of electronic commerce that directly affect the profitability of the business can be singled out:

1. The possibility of higher revenues based on the availability of a wider consumer base and increase of loyalty and repeat purchase of existing customers;
2. The reduction in costs is realized on the basis of electronic service delivery, including the reduction of personnel costs, transportation costs and material costs.

Comprehensive and reasonable interpretation of the concept of e-commerce is presented using the following definitions: electronic commerce covers all types of commercial transactions which are electronically processed data (including text, sound and image) and transmission via communication networks such as the Internet (Andam, 2003). It is the flow of information between organizations, without human intervention, thus ensuring that the flow is continuous from the beginning to the end of each business transaction.

The first central booking systems emerged in the last century during the 60s and represented then internal systems which allowed travel agencies direct access to information on available seats and prices, with the possibility of booking as well. Central booking systems were a precursor to global distribution systems and modern online booking program. The growth of air traffic and the deregulation of air transport stimulates the expansion of CRS on giant computer networks. CRS have enabled companies to compete adjusting their schedule and price demand (Bahalis and Law, 2008).

Among the first investors in information technology was the airline American Airlines, which introduced the SABRE computer reservation system in 1962.

Computer Reservation System (CRS) is a computerized system used for collecting, storing and processing information, as well as managing transactions related to travel. In the mid-80s, CRS develops into a comprehensive global distribution system (Global Distribution System, GDS), which offers a wide range of tourism products and services (transparency of airline destinations, booking of hotels, rent a car, etc.) and provides mechanisms for communication between airlines and travel agencies (Sismanidou et al., 2009).

Global distribution system is the information and communication system designed for the sale of services in the tourism industry that connects service providers in the tourism industry on one hand and sellers of these services (travel agencies) on the other hand as shown in Figure 1. These systems have become electronic supermarkets that connect buyers and sellers, allow one to make a quick and easy reservation, enable sales of the requested services and thereby provide services with additional value (Bahalis and Law, 2008). GDS consolidate information from many airlines, allowing travel agencies, companies and individuals to buy on a single electronic market.

Fig. 1 Display of the global distribution system
Source: author

The displayed image shows that GDS connects multiple CRS. This is the main computer that enables the processing instructions and transmits information directly to end users, travel agencies. GDS offers information and reservations of all tourism products such as accommodation, rental cars, air traffic schedules, etc.

The services of GDS flights in the sector include: issuing tickets, providing information on timetables, prices, availability of places, the provision of the particular sites, online payment and others.

The four leading GDS are (Sismanidou, Palacios and Tafur, 2009): Amadeus, Sabre, Worldspan and Galileo. There are a few smaller or regional GDS, for example: SITA Sahara, Infini (Japan), Axess (Japan), Tapas (Korea), Fantasia (South Pacific), Abacus (Asia/Pacific) and others that serve the interests of specific regions or countries.

Most airlines are included in some of the GDS (Fig. 2).

Amadeus	Galileo	Sabre	Worldspan
Air France Iberia Lufthansa SAS	Aer Lingus Air Canada Alitalia Austrian Airlines British Airways KLM Olympic Airlines Swissair TAP Air Portugal United Airlines US Airways	American Airlines	Delta Airlines Northwest Airlines Transworld Airlines

Fig. 2 Display of the global distribution system
Source: Njeguš, 2010.

1.1. Amadeus

Amadeus has been jointly made in Europe by Lufthansa, Air France, Iberia and SAS. It is interesting that JAT - Yugoslav Airlines had played an important role in the development of Amadeus. Our air company worked together with Lufthansa on the development of Amadeus during the 80s. This system, apart from air traffic, now includes hotels, cruises, rent-a-car services, and also rail traffic. Official headquarters of Amadeus is in Madrid, its development base is in France, while the main servers are in Erding near the Munich airport.

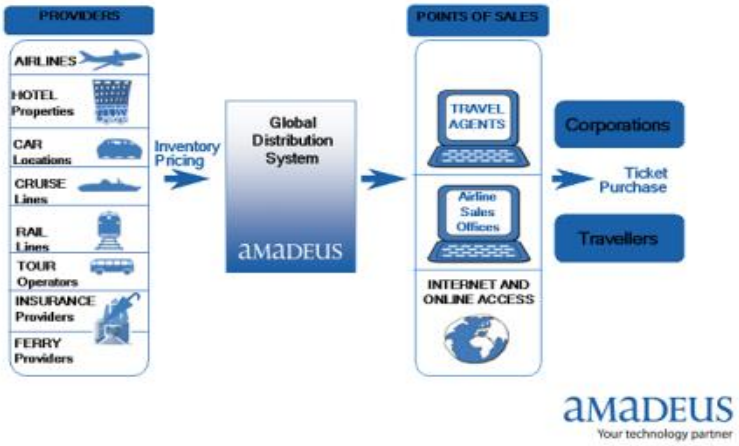

Fig. 3 Amadeus GDS
Source: Website Amadeus

Many global airline companies, about 150 of them, use this system as their own reservation system and through it the sale of tickets of 440 airline companies is possible. The sales network that is connected to Amadeus consists of approximately 100,000

agencies, including many online agencies. Amadeus is used in 195 countries worldwide. The largest online systems based on Amadeus are Opodo and Expedia.

1.2. Sabre

The company Sabre Holding is an integrated reservation system that covers different areas of touristic activities. The members of Sabre Holding are:

- Travelocity,
- Sabre Travel Network,
- GetThere,
- Sabre Airline Solutions.

Nowadays, many major airline companies use this system as their own internal reservation system. Besides American Airlines, its users are: Aeroflot, Etihad, Virgin America and Virgin Australia. Tickets of around 400 airline companies are sold through Sabre, while 44,000 travel agencies use it for sale. The largest and the most popular online agency that uses Sabre is Travelocity.

Sabre Airline Solutions allows airline companies to reduce costs, simplify operations, maximize profits and improve customer service. More than 200 airline companies worldwide use the intelligent support systems designed by Sabre Airline Solutions.

1.3. Global distribution systems in Serbia

In February 2014, the company Air Serbia implemented Sabre Sonic Check-in system at Nikola Tesla airport in Belgrade and in that way made a technological improvement of the system for the registration of passengers. This system brings the functionality in the system of the passengers' check-in on the flight and provides a new and efficient system of monitoring the departures on the home airfield.

The visitors of the site Air Serbia can use this system to make a reservation of the flight, to check the booking, to inform themselves about the luggage, to review the status of the flight, to carry out rental cars and book accommodation as shown in Fig. 4.

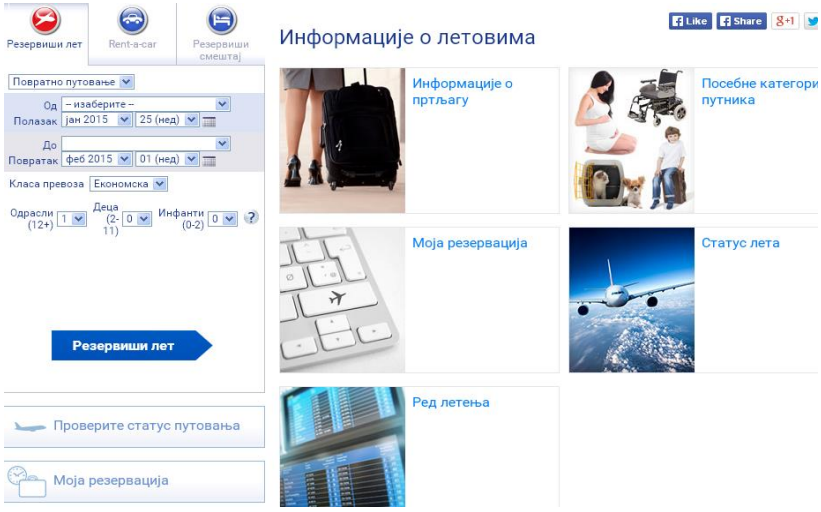

Fig. 4 The display of the Sabre Sonic Check-in system at Nikola Tesla airport in Belgrade
Source: Website AirSerbia

As it can be seen, the system offers the following services:

- tickets issuing,
- providing information on the flight schedule,
- providing information about the price,
- availability of seats,
- reservation of a specific seat, etc.

Beside the company Air Serbia, what is interesting in our country is the application of global distribution systems by the agencies that sell air tickets, one of which is the agency – website superaviokarte.rs, which is shown in Fig. 5.

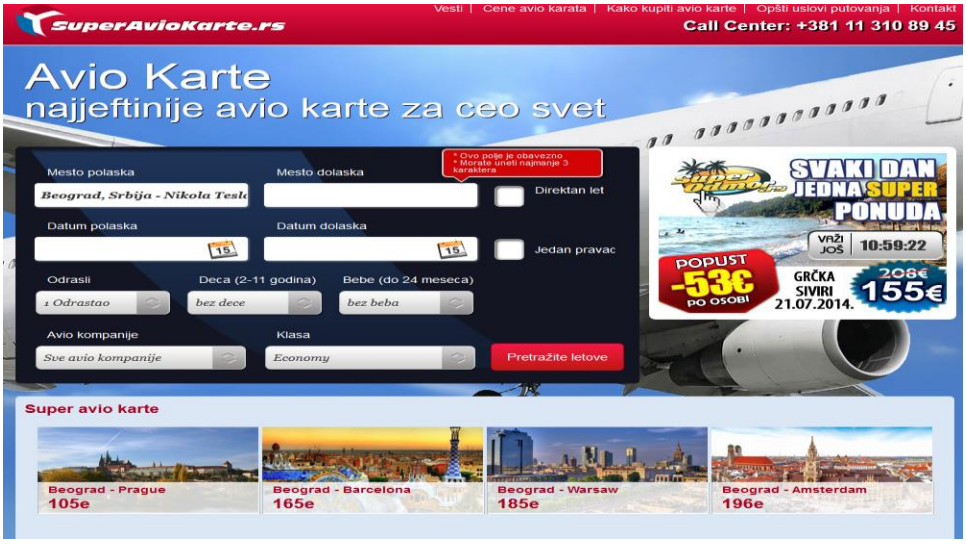

Fig. 5 The display of the agency for the online sale of air tickets „Super avio karte“
Source: Website Superaviokarte

This website acts as a mediator between airline companies and the buyers of airline tickets. The website browses around 500 airline compnies worldwide, provides information about airline tickets for the required route and the required time period, the cost and possibility of buying the same, as well as suggestions for other airline tickets to the same destination but for a different date at a much lower price, if the trip can be postponed to that date. The site offers a lot of other discounts and every day there is one super offer and much more.

This agency achieves the following by applying global distribution systems:

- unlimited offer of airplane tickets,
- the ability to meet every demand of the passengers,
- income from the commissions of the sold services,
- simplified business,
- up-to-date timetables and prices of services,
- automatic tickets issuing,
- increased productivity of the employees,
- access to a huge amount of information,
- savings in business costs, etc.

2. MOBILE TRADE AS THE FUTURE CHALLENGE IN THE AIRLINES SECTOR

In addition to e-commerce, one of the following opportunities for airlines to reach new markets and win them and to keep down the costs of distribution can be achieved by using mobile technology, or by accessing electronic commerce.

Nowadays, the emergence of mobile technology, and corresponding access to the Internet through mobile handsets, has provided many opportunities for customers in the form of immediate information access, online purchases, downloading services, and various educational and entertainment services (Rose et al., 2011).

M-commerce can serve as a unique tool in the aviation sector to improve services where they can create value and enhance business performance. Different business processes can be improved and implemented the integration of mobile technology. The introduction of mobile devices as a choice of interfaces online allowed easier access to information and operations data entry, increased availability of employees in almost every moment, in cases of decision making and the like. Business processes become more dynamic and practical, real-time.

The growth in numbers of mobile device users was a result of the advances in mobile technologies (Kim et al., 2008). Mobile devices have increased the availability, frequency, and speed of communication (Scharl et al., 2005).

Mobile commerce, known as m-commerce, has been defined by Balasubramanian et al. (2002) as any business that occurs on the basis of anywhere and anytime. Abu Bakar and Osman (2005) also defined m-commerce as exchange of goods and services via wireless mobile phones, whilst Varshney and Vetter (2002) see m-commerce as an e-commerce over wireless devices. Gary and Simon (2002) referred to m-commerce as any financial dealings done over mobile devices. In addition, Alsultanny (2012) argued that mobile commerce, including airline ticket purchasing, hotel booking and reservation, and mobile banking, is a subset of electronic commerce.

Kim et al. (2005) suggested that airlines should see mobile commerce as a new and interactive method of business. Thus, mobile commerce provides a direct channel for companies to communicate with their customers through mobile phone, anytime and anywhere. So companies have a new opportunity to provide new services to existing and potential customers via mobile devices.

The main difference between m-commerce and e-commerce definitions is that m-commerce uses a wireless network to perform transactions, and precisely because of these unique characteristics it has massively attracted the attention of customers to e-markets (Kim et al., 2008). Siau et al. (2001) discussed the promises and challenges of mobile commerce and its impact on business environment, identifying four unique characteristics of mobile communication which differentiate it from e-commerce:

- *Ubiquity.* The use of a wireless device enables the user to receive information and to transact anywhere, anytime.
- *Accessibility.* A mobile device enables the user to communicate effectively at any time and place.
- *Suitability.* Portability of a wireless device and its features with data storage for access to information.
- *Localization.* Specific applications will allow the user to receive relevant information on which to act.
- *Instant Connectivity* (*3G* ...). Instant connectivity or "always on" is becoming more prevalent with the emergence of 3G networks, GPRS or EDGE. The users of 3G services will benefit from easier and faster access to the Internet.

- *Personalization.* The combination of localization and personalization will create a new channel to attract customers. Personalization is a means to effectively meet customer needs, making interactions faster and easier, and increases customer satisfaction and likelihood.
- *Sensitivity to Time*. Access to information in real time.
- *Security*. Depending on the specific device user, the device offers a certain level of security.

Companies must recognize mobile commerce as well as innovation, creating marketing opportunities and challenges. Leung Antipas (2001) believes that companies can improve business efficiency using mobile commerce i.e. distribution of information with staff remotely.

SITA research conducted in 2013 shows that 66%, of airlines in the next three years, are planning to make a significant investment in the provision of passenger information via mobile devices, as shown in Fig. 6, and the improvement of existing and introduction of new sales channels in order to achieve greater self-service.

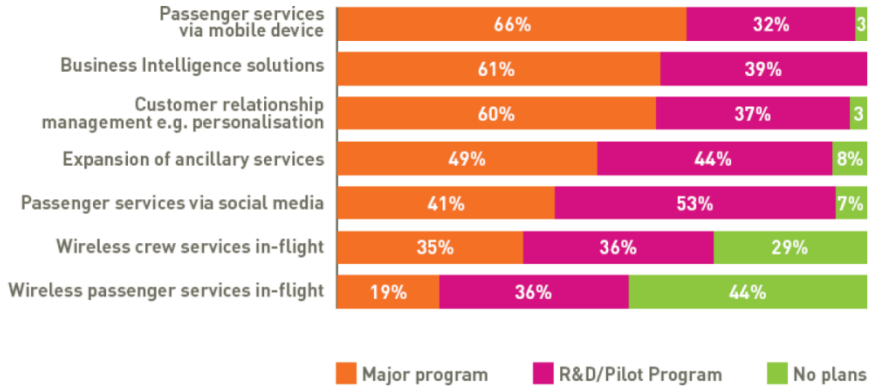

Fig. 6 Airline investment in IT over the coming three years.
Source: SITA

The research indicates that today, the dominant airline sales channel is through website which is channel for generating ancillary sales and it would develop as such; however, in the coming years, tremendous growth of mobile commerce is expected. Currently 37% of ancillary sales is being realized through sites, while 2.4% via mobile phone. However, by 2017, the mobile channel is expected to contribute almost five times more, which represents 11.6% of the total ancillary sales (Fig. 7).

This goal is very ambitious, but there are many factors that go in this direction, and some of them are (SITA):

- A growing number of smartphone users
- The passengers are already familiar with e-commerce, and mobile commerce is not a great leap for them.
- The passengers carry their mobile phones during the flight and they provide them with significant opportunities before, after and during the flight.

Fig. 7 The percentage of sale through new channels
Source: SITA, adapted by the author

The ambitions are that the airline companies make their services available for smart phones as well as on the website. By 2017, about 75% of the airline companies will have achieved that. Within three years, about 70% of the airline companies will be using this technique to increase sales. The expectations are that the offer on the website gets personalized and adapted to mobile phone users.

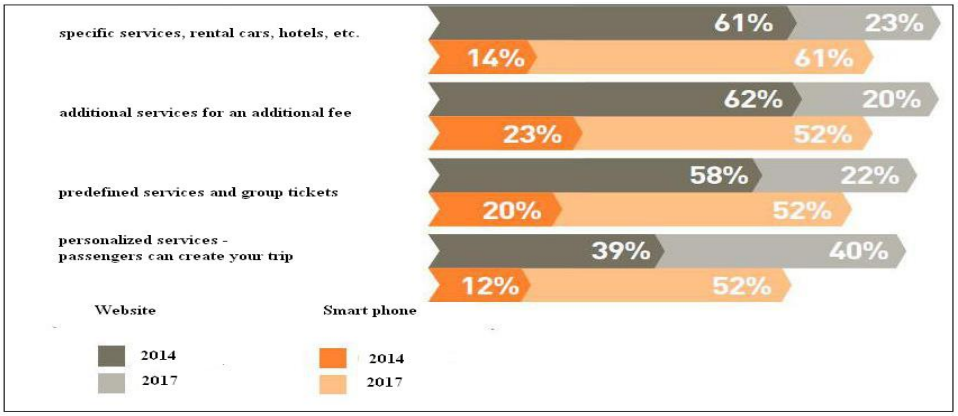

Fig. 8 Airlines usage of mobile commerce
Source: SITA, adapted by the author

The research shows that in the coming period, by 2017, mobile commerce will develop and its applications and services will be used more, which will affect the growth of this sales channel in the airlines sector (Fig. 8).

CONCLUSION

Based on the conducted research and carried out analysis of air flights market, it can be concluded that successful business and development of all participants in air traffic is increasingly dependent on the successful application of modern information and communication technologies in the business.

The degree of implementation of electronic commerce in the airlines sector is at a satisfactory level. The majority of airlines have automated their business in the area of reservations, ticketing, acceptance of passengers for the flight, providing information on the flight schedule, prices of services, etc. With the application of a global distribution system, all successful airlines have joined today the electronic commerce and thus become more competitive in the market, enabling the provision and sale of their services 24 hours 7 days a week and thus reduced their indirect costs and increased the income from sales.

Regarding the degree of the application of mobile commerce in the airlines sector, it can be said that it is at unsatisfactory level and that mobile commerce in the airlines sector is still in its infancy. With the development of new technologies and the growing demands of the users of air services, the imposed requirements in the upcoming period for airlines are to personalize and adapt their offers on the website for mobile phone users and in that way approach mobile commerce and increase their sales. Mobile commerce in the airlines sector is becoming a tool of competitiveness, because the number of users of powerful mobile phones is growing.

It is important to emphasize that the global distribution systems must follow the trends of development of information and communication technology and continuously expand the range of their services because it is the only way to survive in the future.

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ANALIZA STEPENA PRIMENE ELEKTRONSKE I MOBILNE TRGOVINE U AVIO SEKTORU

U ovom radu autori sagledavaju i analiziraju stepen primene elektronske i mobilne trgovine u avio sektoru, obrazlažući da savremene informaciono-komunikacione tehnologije pružaju snažan instrument za avio kompanije i mogu značajno uticati na njihovo poslovanje, strukturu i strategiju. Internet se u avio sektoru smatra najvažnijom tehnološkom revolucijom, jer su njegovom pojavom rezervacioni sistemi prestali da budu pasivne kompjuterske arhive i evidencije i postali aktivni operativni sistemi koji neslućenom brzinom transformišu avio saobraćaj. Sredinom 80'tih godina dolazi do pojave posebnih tipova informacionih sistema, globalnih distribucionih sistema, koji su namenjeni distribuciji turističkih proizvoda, čijom implementacijom na vebsajtu avio kompanije pristupaju elektronskoj trgovini, odnosno vrše pružanje usluga i obavljaju prodaju avio karatana Internetu. Međutim, razvoj tehnologije, pojava pametnih telefona i brojni drugi faktori danas nameću potrebu avio kompanijama da pristupite mobilnoj trgovini i učine svoje usluge dostupnim i korisnicima pametnih telefona kao i na vebsajtu.

Ključne reči: *ICT u avio sektoru, onlajn rezervacija avio karata, mobilna trgovina u avio sektoru, globalni distribucioni sistem.*

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EXAMINATION OF THE PERFORMANCES OF MAXIMUM LIKELIHOOD METHOD AND BAYESIAN APPROACH IN ESTIMATING SALES LEVEL

UDC 31:658.8

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Abstract. *The method of maximum likelihood and Bayesian method are widely used in data processing, not only in economics but also in other fields of research. In order to identify which approach has better performances, these methods are analyzed on the selected economic data. By comparing the estimated values obtained by applying the maximum likelihood method and Bayesian method on the data that was obtained from the company CaliVita Int., it was concluded that the Bayesian inference with informative priors gives more accurate estimates.*

Key words: *method of maximum likelihood, Bayesian method, estimation, prior, sales level*

INTRODUCTION

Historically, classical statistics have had the main role in researches compared to Bayesian methods, but in the near past, Bayesian approach has become very popular in creating statistical models for solving problems in different research fields. Bayesian inference is known as an analytical method that combines information obtained from the experiment with prior knowledge. Contrary to the maximum-likelihood approach, the Bayesian framework requires the explicit prescription of a prior probability distribution for the unknown signal parameters [15].

On the other side, the method of maximum likelihood, as a method of classical statistics, does not include any prior information that maybe exists from previous research. Very often, researchers are faced with the problem that is common for one data set and they have to estimate parameters in the moment of taking data.

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Many supporters of classical statistics do not accept the use of subjective prior information in objective economic science. The debate about the role of prior information in statistics is still going on. Actually, prior information is a controversial aspect of Bayesian methods, but Bayesians, as the final line of defence, have developed non-informative priors for many classes of model [9]. In order to get conclusions about the importance of prior information, the results of research with and without presence of prior information are compared in this paper.

1. LITERATURE REVIEW

Even though Bayesian methods are powerful and can be used in a variety of analytic models, the strenuous programming and computational demands have discouraged many researchers from using them [19]. Today, the use of Bayesian methods in empirical researches is rapidly growing, because there is a lot of appropriate statistical software that can be successfully applied in different situations. According to the complexity, the models are very different, so the use of some is very simple and allows the researcher to easily reach the desired estimates and test statistics, while others require researchers to possess programming skills.

The maximum likelihood method has broad and significant application in determining the statistical estimations with good characteristics. Its application, as well as application of Bayesian methods, is not only limited to economics, but it can be successfully implemented in psychology, medicine, biology, tourism, etc.

Lemmon, Brown, Stanger-Hall and Lemmon [11] study the effect of ambiguous data, or missing values for research in biology using the method of maximum likelihood and Bayesian method. Ward [18] in his paper compared Bayesian and classical methods for estimation of ecological models, where the maximum likelihood criteria consistently favoured simpler population models when compared to Bayesian criteria.

On the other hand, Flurry and Shepard [6] studied the wide application of Bayesian inference and likelihood methods in microeconomics, macroeconomics and financial econometrics. In doing so, they illustrate these methods on four problems in econometrics, producing rather generic methods. Taken together, these methods imply that if we can simulate from an economic model we can carry out likelihood based inference using its simulations [6].

Pitt, Silva, Giordani and Kohn [13] are concerned with developing a methodology for Bayesian inference for general time series state space models using Markov chain Monte Carlo (MCMC) simulation with the likelihood estimation. Fernández-Villaverde and Rubio-Ramírez [5] showed how to undertake likelihood-based inference in dynamic macroeconomic models. They also describe how to use the output to estimate the structural parameters of the model, those characterizing preferences and technology, and to compare different economies. Both tasks can be implemented from either a classical or a Bayesian perspective.

Bayesian estimation may also be used for solving some problems that are commonly encountered in traditional statistics; for example, obtaining estimations for impossible parameters, identification of the model [8], and obtaining more precise parameters estimations [3]. Also, Bayesian methods are more plausible ways to analyze small sample data compared with the maximum likelihood method [19]. In this paper, the comparison of the maximum likelihood and Bayesian method is made on the data that was obtained from

the company CaliVita Int. Calculations were made for two types of prior information that can be applied in Bayesian inference, informative and non-informative, and the results are compared with maximum likelihood estimates.

2. Research Methodology and Results

In order to make a comparison of the methods of classical and Bayesian statistics, the data were obtained from the company CaliVita Int. representative for the Republic of Serbia, Fitco LLC, Novi Sad. The selected data related to 252 products [12]. For research purposes, the products are sorted by: product name, product type, manufacturer, price and realized sales in the period from January to June 2014 and processed in statistical packages IBM SPSS and IBM SPSS Amos *Version 21*. IBM SPSS Amos applies a general approach to data analysis known as Structural Equation Modeling –SEM. It is also known as the analysis of covariance structures or causal modeling.

A sample of 252 products is considered as sufficient for successful research tests because Bayesian statistics is not based on large samples [17]. Many articles also show the advantages of Bayesian statistics in terms of a small data set [19]; [10].

To perform the analysis, four variables were selected: *Product type*, *Manufacturer*, *Sales level in May* and *Sales level in June*. The variables *Sales level in May* and *Sales level in June* are defined as observed, endogenous variables. They are conditioned with two observed, exogenous variables: the *Product type* and the *Manufacturer*. Figure 1 shows the model for selected data.

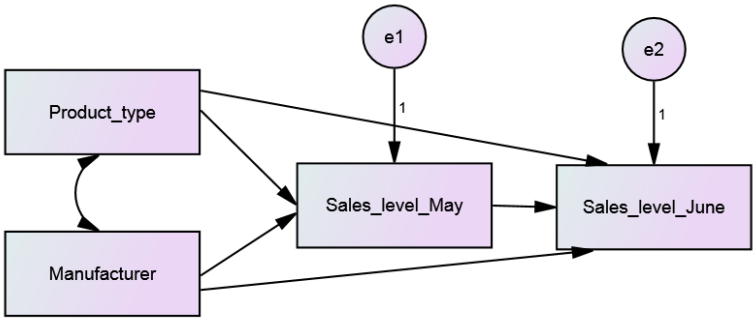

Fig. 1 Structural model

Thus defined, the model indicates the need to test the impact of product types and manufacturers to sales level in May and June. At the same time, there is a need for examining the mutual influence and a correlation between the variables *Product type* and the *Manufacturer*.

2.1. Research results obtained by method of maximum likelihood

The application of proper statistical package has enabled the estimation of the collected data using method of maximum likelihood and Bayesian method, and subsequently, drawing

conclusions by comparing the results of the research. Table 1 represents the results obtained by applying maximum likelihood method on the selected data.

Table 1 Maximum Likelihood Estimates

Regression Weights: (Group number 1 - Default model)

			Estimate	S.E.	C.R.	P	Label
SL_May	<--	Manuf	-3.730	0.792	-4.709	***	
SL_May	<--	PrType	-0.941	1.502	-0.626	0.531	
SL_June	<--	Manuf	-1.090	.465	-2.346	0.019	
SL_June	<--	SL_May	0.730	.035	20.581	***	
SL_June	<--	PrType	-0.033	.845	-0.039	0.969	

Standardized Regression Weights: (Group number 1 - Default model)

			Estimate
SL_May	<---	Manuf	-0.308
SL_May	<---	PrType	-0.041
SL_June	<---	Manuf	-0.097
SL_June	<---	SL_May	0.784
SL_June	<---	PrType	-0.002

Means: (Group number 1 - Default model)

	Estimate	S.E.	C.R.	P	Label
PrType	6.996	0.142	49.276	***	
Manuf	6.246	0.269	23.200	***	

Intercepts: (Group number 1 - Default model)

	Estimate	S.E.	C.R.	P	Label
SL_May	69.800	10.095	6.914	***	
SL_June	11.827	6.191	1.910	0.056	

Covariances: (Group number 1 - Default model)

			Estimate	S.E.	C.R.	P	Label
Manuf	<->	PrType	3.926	0.654	6.000	***	

Correlations: (Group number 1 - Default model)

			Estimate
Manuf	<->	PrType	0.409

Variances: (Group number 1 - Default model)

	Estimate	S.E.	C.R.	P	Label
Manuf	18.193	1.624	11.203	***	
PrType	5.060	0.452	11.203	***	
e1	2386.501	213.029	11.203	***	
e2	754.074	67.312	11.203	***	

Source: own calculations

All values that are explained in Table 1 also appear on graphs; first, after calculating standardized estimates (Fig. 2) and second, after calculating unstandardized estimates (Fig. 3).

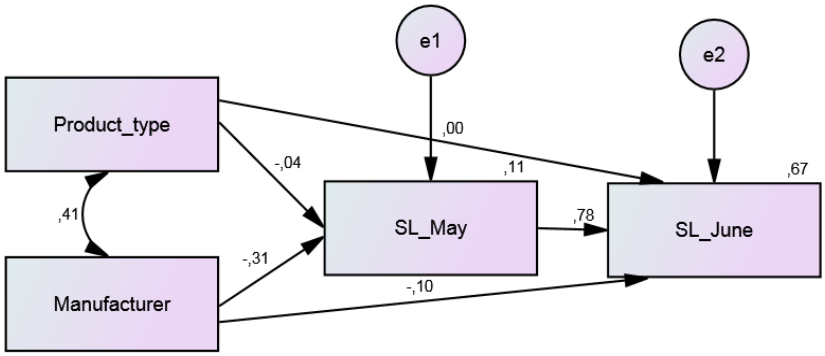

Fig. 2 Structural model with standardized estimates

The value 0.41 is correlation value between *Product type* and *Manufacturer*. Values -0.04; -0.31; -0.10; 0.00 (according to Table 1 this value is -0.002) and 0.78 are *Standardized Regression Weights*.

If we calculate unstandardized estimation, the results will be as follows:

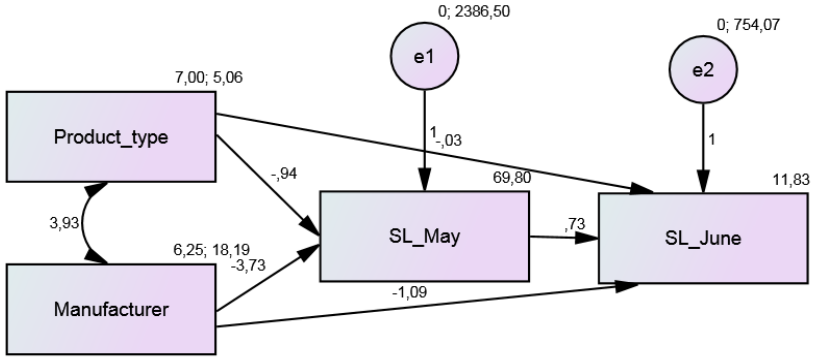

Fig. 3 Structural model with unstandardized estimates

The values from Figure 3 presented in Table 1 are sorted according to their meaning. It can be concluded, that the covariance between *Product type* and *Manufacturer* is estimated to be 3.93. Right next to the covariance in the *S.E.*column is presented the estimated standard error of about 0.654. The estimate 3.93 indicates that the observation of approximately normally distributed random variables is centred around population covariance with a standard deviation of 0.654.

The values of critical ratios are represented in the C.R. column. Dividing the covariance estimate by the estimate of its standard error gives $z = 3.926/0.654 = 6.000$. In other words, the covariance estimate is 6 standard errors above zero. The probability of getting a critical ratio as large as 6 in absolute value is less than 0.001, so the covariance

between *Product type* and *Manufacturer* is significantly different from zero at the 0.001 level (two-tailed).

The estimated covariance between *Product type* and *Manufacturer* (3.93) is the value that will be compared with the Bayesian estimates. In our example, we used non-informative and informative priors in order to get more precise estimates.

2.2. Research results obtained by Bayesian method

The Bayesian paradigm is characterized by several advantages relative to the classical one, like the coherence of the whole paradigm, which is derived from the systematical applying of the Bayes law, the concept of subjective probability, the general character of the Bayesian methods which do not ask for special regularity conditions, the sounder definition of the concepts of confidence interval as well as testing [1]; [14].

For carrying out the research using Bayesian estimation it is necessary to select the appropriate prior distribution. In many cases, chosen prior will contain very little information, so the conclusions will be based only on data. Such information is called non-informative prior [12].

However, there is no prior distribution that is completely non-informative, even uniform distribution that IBM SPSS Amos used as default for each parameter, because each prior distribution carries some information. The results obtained from the Bayesian analysis will change if prior distribution changes. In an analysis conducted by the author, it will be seen that changing prior distribution affects the results of research in terms of improving their accuracy.

2.2.1. Application of non-informative uniform prior

In many cases, our prior beliefs are vague and thus difficult to translate into an informative prior. We therefore want to reflect our uncertainty about the model parameter(s) without substantially influencing the posterior parameter inference. The so-called *non-informative priors*, also called *vague* or *diffuse* priors, are employed to that end [16].

A non-informative prior might be used in the genuine absence of prior information, or if there is disagreement about the likely values of hypotheses or parameters. It may also be used in comparison with more informative priors as one aspect of a sensitivity analysis regarding posterior inferences according to the prior [2]. In literature, non-informative priors are also called objective priors and they are part of objective Bayesian analysis [7].

In our example, initially selected prior distribution is uniform prior distribution and it has the character of non-informative distribution. The results for estimated covariance between *Product type* and *Manufacturer* with the applied uniform distribution are shown in Table 2.

Table 2 Bayesian estimates with non-informative prior

	Mean	**S.E.**	**S.D.**	**C.S.**
Covariances				
PrType<->Manuf	4.036	0.005	0.683	1.000

Source: own calculations

If the prior distribution is uniform then the posterior mean will be close to the estimate obtained by method of maximum likelihood. It is confirmed in our example where the estimated posterior mean for covariance between *Product type* and *Manufacturer* is 4.036 and the estimated covariance obtained by the method of maximum likelihood is 3.926. In Fig. 4 we can see that the posterior distribution is centered close to 4 that corresponds to the posterior mean (4.036).

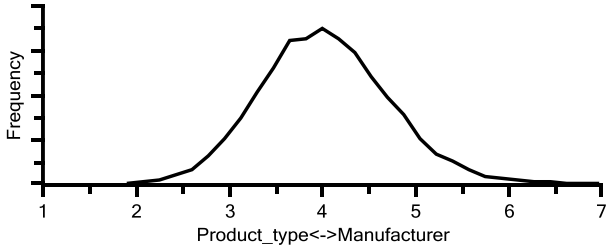

Fig. 4 Posterior distribution with non-informative prior

In this way, it was confirmed that in the case where the prior information is diffuse or non-informative, the results of classical and Bayesian statistics differ very little. In order to find more precise estimates in the next step we choose informative prior.

2.2.2. Application of informative normal prior

The prior that contains the most amount of certainty about the population parameter is an informative prior. Informative priors contain strict numerical information that is crucial to the estimation of the model and can have a large impact on final estimates [17]. The problem with using an informative prior is that people might use different background information (or interpret it differently). Thus, informative priors often seem subjective [4].

In order to prove previous claims, instead of initially selected uniform distribution, we now choose normal distribution as prior distribution. Normal distribution has the character of informative prior distribution. The results for estimated covariance between *Product type* and *Manufacturer* with the applied normal distribution are shown in Table 3.

Table 3 Bayesian estimates with informative prior

	Mean	**S.E.**	**S.D.**	**C.S.**
Covariances				
PrType<->Manuf	1.887	0	0.279	1.000

Source: own calculations

In Fig. 5 we can see that the posterior distribution is now centered close to 1.9 that correspond to the posterior mean (1,887).

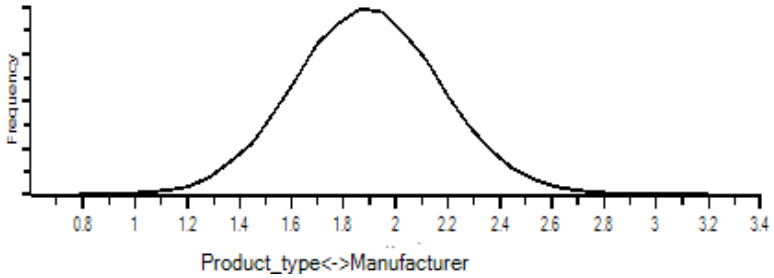

Fig. 5 Posterior distribution with informative prior

If we want to make final conclusions, we should compare results of applied methods. First, it is necessary to compare the posterior standard deviation of Bayesian statistics, (denoted S.D.) with a standard error of classical statistics (denoted S.E.) which is a useful measure of uncertainty. The value of S.D. is 0.279 and of S.E. is 0.654. Lower value of S.D. indicates that the results of Bayesian methods are more precise.

Second, we have to compare estimated covariance between *Product type* and *Manufacturer*. Unlike the case where the uniform distribution was a prior and where the results were not much different compared to classical estimates, in the case where the normal distribution is chosen for a prior, the situation is changing. Now, estimated posterior mean for covariance between *Product type* and *Manufacturer* is 1.887 and the estimated covariance obtained by the method of maximum likelihood is 3.926. So, we can conclude that we can get more accurate estimates if we use normal informative distribution as a prior distribution.

CONCLUSION

For many years, classical statistics had objective advantage compared to Bayesian approach. Supporters of Bayesian statistics did not have an opportunity to emphasize the possibility of applying Bayesian methods in data processing, because there was a real inability to perform complex methods to handle large amounts of data. The emergence of adequate software solutions has enabled intensive application of Bayesian methods in different research areas.

Comparative analysis of maximum likelihood method and Bayesian method was obtained on 252 products and their sales level from January to June 2014. By using the statistical package IBM SPSS Amos and constructing the structural model, the base for further analysis was made. The example has shown the importance of prior information in the Bayesian estimation, and thereby confirmed that the Bayesian approach is more complex because there is an obvious need for estimating a prior probability and examining its sensitivity. Including normal prior distribution, as informative prior, it was concluded that the estimates obtained from Bayesian approach represent an improvement of estimates obtained by classical method in terms of accuracy.

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ISPITIVANJE PERFORMANSI METODA MAKSIMALNE VERODOSTOJNOSTI I BAJESOVOG PRISTUPA U OCENJIVANJU NIVOA PRODAJE

Metod maksimalne verodostojnosti i Bajesov metod nalaze široku primenu u obradi podataka, ne samo u oblasti ekonomije već i u drugim poljima istraživanja. Cilj rada je da se kroz komparativnu analizu ova dva metoda na odabranim ekonomskim podacima identifikuje koji od pristupa ima bolje karakteristike u datim okolnostima. Poređenjem ocenjenih vrednosti dobijenih primenom metoda maksimalne verodostojnosti i Bajesovog metoda na podacima o ostvarenoj prodaji kompanije CaliVita Int. izvedeni su zaključci o performansama oba pristupa. U radu je pokazano da odabirom informativnih apriornih informacija, Bajesov pristup daje preciznije ocene u odnosu na rezultate dobijene primenom metoda maksimalne verodostojnosti.

Ključne reči: *metod maksimalne verodostojnosti, Bajesov metod, ocenjivanje, apriorna informacija, nivo prodaje*

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PROTECTION OF COMPETITION IN THE OIL AND OIL DERIVATES MARKET IN THE REPUBLIC OF SERBIA

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Abstract. *It is generally known that the market represents the overall relationship between supply and demand. The relations between these two are constantly intertwining and are constantly influenced by different factors. Depending on their relationship as well as on factors specific to a particular economy, there are different market conditions, such as: monopoly, oligopoly, limited oligopoly, limited competition, perfect competition, etc. The liberalization of the domestic oil and oil derivatives market represents an open space for creating a high-quality competitive relationship. However, the course of strengthening the competitive relationship should be carried out considerably faster. Market conditions and competitiveness are in practice determined by the concentration in the observed market. Competition is in a particular relevant market expressed by a number of concentration indicators. Thus, an important aspect of the analysis of competitiveness intensity in the domestic oil market is measuring the concentration of supply, which will be analyzed in this paper. It can be said that every market is characterized by a certain level of competitiveness among market participants, and through these competitive relationships, their market power permeates. The research uses concentration indicators to show the concentration in the domestic oil and oil derivatives market, its current features and also to analyze the potential of strengthening the competitive relationship in the future.*

Key words: *protection of competition, oil and oil derivatives market, concentration indicators, concentration*

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INTRODUCTION

Oil and oil derivatives market in the Republic of Serbia is characterized by a certain level of competitiveness among oil companies. Through concentration and competitive market relations, their market power spreads out. The theoretical approach to the study of market power primarily starts from the market structure form, and these forms are numerous. There are different market structures. Most of the real market situations include elements, number of participants, conditions and monopoly dominance or perfect competitiveness. Oligopoly is one of the market situations, which in terms of number of participants and conditions that rule upon it, lies between monopoly and perfect competitiveness. It is such a market situation where there are little or few sellers who sell similar or slightly different products. If a product offered by oligopolists is homogeneous, then it is a homogeneous oligopoly. If a product offered by oligopolists is inhomogeneous, then there is a heterogeneous oligopoly (Zdravkovic, D., (2006); Zdravković, Stojanovic, B., Đorđević, D., Stojanovic I. (2004)).

Thus, oligopoly has been a very common market situation. For instance, in the domestic market, the following industries are adequate examples of oligopoly - sugar industry, cement industry, tobacco industry, dairy industry and mobile phones industry. The oil market is also oligopoly. More specifically, as oil is homogeneous product, it is a homogenous oligopoly market. What is typical for this type of market is that companies that operate in this type of market in the long run generate huge profit, and often disable the entry of new competitors. Concentration in this kind of market represents an indicator of the level on which the total sales is controlled by a small number of participants and the high level of competitiveness in combination with low concentration level represents a condition to be pursued. However, the concentration in the domestic oil market is not uniform, thus potential competitors are facing with economies of scale, large investments in facilities modernization, investments, effective pricing policy of the leading companies, institutional and political barriers and other similar things (Horvath, 1970, 446). In addition to all this, one should bear in mind the experience of oligopolistic companies that can be manifested in their capability of considerably reducing the price of their products or overwhelming the market with their products, which can only discourage potential competitors. From the perspective of placing barriers, an oligopolistic market can act as a market monopoly, especially if there is a common interest and agreement among oligopolists in the long run.

What is also interesting is the division of market oligopoly in terms of the distribution of the market share. That is how we have loose oligopoly, when four leading companies in the market have up to 40% market share, and tight oligopoly, the case when the four largest companies have 40 to 50% market share. Arrangements can be strong or long-term and short-term or weak, respectively. In order for an agreement to be reached, it is desirable that companies have similar potential, demand conditions and costs (Zdravkovic, D., (2006)). One kind of a strong agreement is a cartel. An adequate example of a tight oligopoly based on a cartel principle is the Organization of the Petroleum Exporting Countries (OPEC).

In the contemporary market economy, competition law is used to sanction the secret of commercial cooperation, strong and weak agreements on a joint approach with the intention of achieving extra profits and violation of the principle of competitiveness at the

expense of business competitors and consumers themselves. These activities are hard to detect, investigate and punish, especially in corrupt countries. Hidden and secret agreements are realized in the market by using different signals, for example, a competitor is signaling what price he prefers, and other companies follow him, in accordance with the previously established agreement.

In the first part of this paper, the attention is paid to the variables on the basis of which the situation and changes in the domestic oil and oil derivatives market in the Republic of Serbia is monitored. This market is covered by oil companies. The second part of the paper deals with the application and presentation of metrics and also with the analysis of the concentration level in the domestic oil and oil derivatives market. The analysis of the concentration level has led to the interesting tendencies that occur in the observed market.

1. THE TURNOVER IN THE DOMESTIC OIL AND DERIVATES MARKET

In a market economy in the world, there are many companies that make profit and generate income as a dominant company in oligopoly conditions. IBM, Procter Gamble, General Electric, Kodak, Hewlett Packard and other companies achieve a market share of over fifty percent by selling their products. A quite common example is that the percentage of sales of products of certain companies in a particular market ranges between 60 and 70 percent. In Serbia, this kind of market structure is characteristic for oil and oil derivatives market, and the dominant company is Petroleum Industry of Serbia (hereinafter NIS), regarding retail sale.

Prior to application of measurement indicators, that is the indicators and analysis of the level of concentration, it is necessary to choose a variable based on which the situation and changes in the domestic market of oil companies will be monitored. Data and information regarding turnover, production and costs of oil companies operating in the domestic oil and oil derivatives market is difficult to obtain. There are several reasons for this. First, Data Protection Law provides the right and obligations of oil companies to hold as a secret a good deal of data and pass them only to the legally competent institutions. Second, the non-transparency of the majority of legal and economic institutions also further complicate the collection and processing of necessary and available data. Thus, availability of the relevant data of interest for the study of business efficiency, concentration, competitive relations and market power is reduced to a low level. Objectively speaking, at that very moment, the most suitable variable is the total turnover of oil the company has achieved in the domestic retail market (excluding Kosovo and Metohia). For the purpose of identifying key trends in the oil market, an overview of the total turnover of fifteen oil companies operating on the territory of the Republic of Serbia for the period from 2010 to 2014.

Table 1 The total turnover of domestic oil companies during the period from 2010 to 2014

Registered name	2010	2011	2012	2013	2014
ДОО ЕУРО ПЕТРОЛ СУБОТИЦА	3,908,874	5,464,054	6,027,370	5,635,528	554,234
ДОО ЗА ТРГОВИНУ И УСЛУГЕ ГАСПЕТРОЛ ПАНЧЕВО	1,254,885	1,424,032	1,467,994	1,239,017	128,335
ПЕТРОЛ ДОО БЕОГРАД	945,557	1,438,410	2,107,860	4,760,596	4,554,469
ЕУРО ПЕТРОЛ ТРАНС ДОО СУБОТИЦА	226,891	243,212	233,656	244,419	234,971
НАФТАХЕМ ДОО НОВИ САД	7,684,361	11,066,679	17,677,041	14,511,628	14,525,764
ЕВОЛУЦИЈА 2004 ДОО БЕОГРАД	4,984,100	5,401,846	5,342,950	6,194,219	6,212,478
РАДУН АВИА ДОО НОВИ САД	1,507,597	2,053,630	2,663,442	2,888,821	2,457,867
СТАНДАРД ГАС ДОО НОВИ САД	2,842,420	4,102,700	5,586,532	6,241,883	6,457,817
НАФТА АД БЕОГРАД	9,422,196	12,616,517	5,568,006	5,061,697	5,002,354
ЈП ТРАНСНАФТА ПАНЧЕВО	484,326	464,379	581,967	818,758	658,914
КНЕЗ ПЕТРОЛ ДОО ЗЕМУН	18,820,128	31,281,957	40,369,705	37,597,349	38,958,899
ЛУКОИЛ СРБИЈА АД БЕОГРАД	37,551,658	44,057,626	45,154,451	30,242,523	33,656,847
ИНТЕРМОЛ ДОО БЕОГРАД МОЛ ДОО	11,430,785	13,202,373	18,059,526	20,248,316	19,850,411
ОМВ СРБИЈА ДОО БЕОГРАД	31,169,935	34,897,696	38,108,709	30,937,667	28,969,747
НИС АД НОВИ САД	161,148,850	186,882,958	226,156,906	252,214,729	239,214,757
Total turnover in domestic market	293,382,563	354,598,069	415,106,115	418,837,150	401,437,864

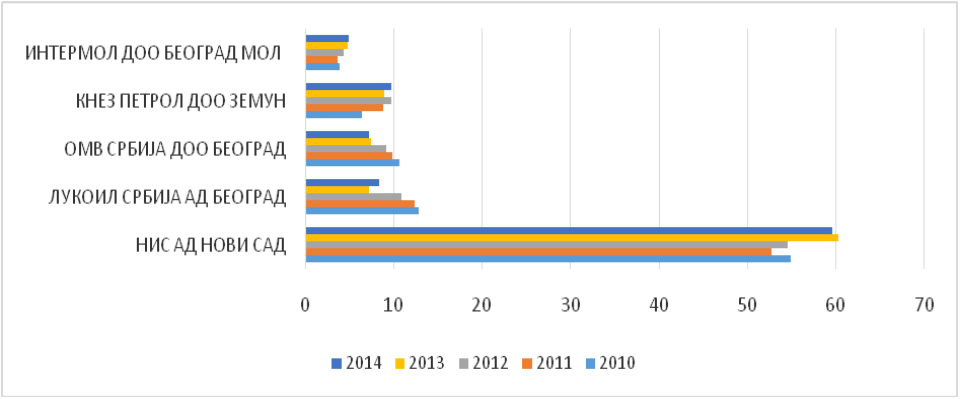
Source: *Business Registers Agency*

From Table 1 that depicts the annual retail turnover of the domestic oil companies, it is clear that *NIS* has the highest turnover on annual basis. The average share in total turnover per year ranges between 54% and 60%, which is a really big market share. The total turnover during the observed period had been increasing at a rate of 18%, except for the last year when a slight drop of 2.5% was recorded.

Table 2 Percentage share of the first seven domestic oil companies in total in the period from 2010 to 2014

Registered name/Year	2010	2011	2012	2013	2014
НИС АД НОВИ САД	54.93	52.70	54.48	60.22	59.59
ЛУКОИЛ СРБИЈА АД БЕОГРАД	12.80	12.42	10.88	7.22	8.38
ОМВ СРБИЈА ДОО БЕОГРАД	10.62	9.84	9.18	7.39	7.22
КНЕЗ ПЕТРОЛ ДОО ЗЕМУН	6.41	8.82	9.73	8.98	9.70
ИНТЕРМОЛ ДОО БЕОГРАД МОЛ	3.90	3.72	4.35	4.83	4.94
НАФТА АД БЕОГРАД	3.21	3.56	1.34	1.21	1.25
ЈП ТРАНСНАФТА ПАНЂЕВО	0.17	0.13	0.14	0.20	0.16

Source: *Business Registers Agency*



Graph 1 Percentage share of the first seven domestic oil companies in total in the period from 2010 to 2014

Besides the presented data about the revenue growth, and revenue from sales, far more valuable information relates to the tendency of concentration of market power and it can be obtained by analyzing the data in Table 2. Although, it is evident that the domestic oil and oil derivatives market is oligopoly, the available and presented data indicate that the current market is moving away from theoretical and classical oligopoly. In the reported period, only one oil industry had a share of 54% to 60% of total retail trade, while the first five realized 87% of the turnover in the total turnover in the last five years. Table 2 and Graph 1 clearly show the turnover realized by large companies. They do this at the expense of smaller oil companies. Although there is a tendency of association among private oil companies, growing market power of certain oil companies is more pronounced.

2. Concetration Indicators In The Market And Measures

In economic theory and practice, there is a relatively widespread misconception that large market share automatically means great market power and violation of competitive relationships. This so-called traditional understanding links market power to market share, considering that profitable price increase is more likely to happen in companies with larger market share than in those who have less market share. The reason for this is the large market share of certain companies in the total turnover. Concentration indicators

show the share of every company's total turnover observed on the relevant market. On the basis of the market share of companies the relations among them are formed within a certain relevant market and the degree of concentration on the market is determined. This clearly shows the nature of the relationship of the observed companies. This is why concentration indicators are important. They describe the structure of a market and are often called structural indicators. As such, they are used during the implementation of the antitrust policy measures. The holders of the antitrust policy often rely on the calculated value of this indicator in order to make important decisions regarding the performance of certain companies in the relevant market. They enable the analysis of the current market conditions, taking into consideration the changes that occur in it. As such, we use them to predict and analyze future trends in the market.

Assessing the relevant market involves its defining both from the geographical aspect, and the aspect of the product that is sold in that market. Thus, from the point of view of the participants industry in the particular market, we can distinguish between the relevant product market and the relevant geographic market. The relevant product market can be seen in a narrow and in a broader sense. The relevant product market in the narrow sense means a set of products or services for which the observed participant is specialized, for example - production of Euro-diesel in the domestic oil market. The relevant product market in the broader sense means a set of products or services for which the observed participant is less specialized, such as - Energy Market in the Republic of Serbia, that is oil and oil derivatives market, liquefied petroleum gas, oil, and lubricants. Furthermore, the relevant geographic market can be understood in a narrow and in a broader sense. If the narrower geographical area, say the territory of the city or region and wider is observed, then we are talking about the relevant geographic market in a narrow sense. If we observe the territory of a state, province or alliance of individual states, then the relevant geographic market in a broader sense is in question. The results of the market power of the company will be considered more precise if they are calculated for the relevant geographic market in a narrow sense, and vice versa. Setting boundaries in terms of product and space means defining the framework within which a competition analysis will be performed based on the selected variables, and the relative market power will be estimated. By determining the relevant market, it becomes clear which companies are those that compete with each other in respect of certain products offered in a particular geographic market become known. In the economic theory and practice, there are different methods by the help of which, the relevant market can be defined, and in this paper, the relevant market is clearly framed and defined as the retail market of oil and oil derivatives in Serbia.

There are numerous concentration indicators that economists use to describe the degree of market restrictions in the most relevant way. The representation of the level of market restrictions depends on market participants and the distribution of market share, sales, incomes, region and other similar variables among them in one market. Otherwise, there are a number of indicators that provide a relative image of market concentration within one agricultural branch. The most important are:

- Concentration Ratio;
- The Herfindahl - Hirschman Index of concentration;
- The Hannah - Kay index of Domination;
- Index of Domination;

- The Hall -Tideman Index (HTI) and the Rosenbluth Index;
- The Comprehensive Industrial Concentration Index;
- Gini coefficient;
- Lorenz curve;
- Uncertainty coefficient and others.

Taking into consideration the specificities of the of oil and oil derivatives market in the Republic of Serbia, the advantages and disadvantages of the statistical apparatus, as well as the data we have access to in order to assess concentration, it is necessary to affirm a few concentration indicators in order to determine the level of concentration in the market. This is supported by the fact that the analysis of the results of only one indicator does not indicate clearly the nature of the concentration of the retail market offers. For example, a significant disadvantage with concentration ratio represents an insight into the market shares of smaller companies that bypasses the calculation of this indicator, and certainly affects the industrial concentration. Such restrictions are and can be bypassed only by applying the calculation of several concentration indicators. The combination of several concentration indicators creates a clearer image of concentration in a particular market because every concentration indicator is special, but it also complements other indicators with its characteristics. Thus, in this paper, the analysis of the market concentration will be based on the use of several indicators of concentration. As seen before, the *Concentration Ratio*, the *Herfindahl-Hirschman index of concentration*, *Uncertainty coefficient* and *Comprehensive Concentration Index* have proved to be the most commonly used indicators. Therefore, we will use in this paper the four abovementioned indicators.

2.1. Concentration Ratio

Index of shares of *n* companies or ***concentration ratio*** (concentration coefficient) represents an indicator that is calculated as the sum of the market shares of *n* largest companies in the market and as such it is very easy to understand (Waldman, E., D., Jensen, J., E. (2001)). It can be represented using the following formula in Figure 1 (Savic, 2000, 4):

Fig. 1 Concentration ratio

$$CR_n = \sum_{i=1}^{n} S_i \tag{1}$$

whereby S_i represents market share of the *i* company, which is obtained through form:

Fig. 2 Market share of the *i* company

$$Si = \frac{q_i}{Q} 100 \tag{2}$$

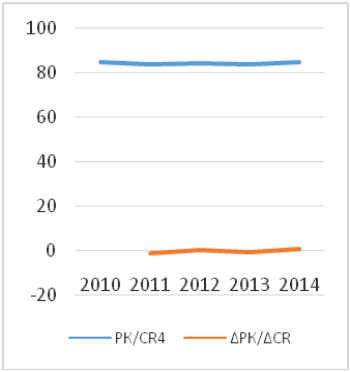
whereby q_i represents the sales, that is the income of the *i* company, and *Q is* the overall sales at the level of branches, retail trade revenue (see Figure 2).

The number of companies that will be included by using these indicators usually ranges between 4 and 10 (n=4-10), and this decision is up to specialized organs that are professionally engaged in monitoring the level of concentration, provided that this

coefficient is used as an official indicator of the limited market. It is believed that taking a large number of companies in the analysis can reduce the analytical significance of this indicator by increasing the value of the index. What ensures the objectivity of this indicator is choosing a small number of companies which have the most impressive offers, thus affecting the conditions of competition mostly. Most experts would agree with this, and because of that, companies whose size (income, sales, turnover) influences the concentration of branches are usually taken for the purpose of analysis. It is usual to take four companies CR_4. CR_4 as a concentration ratio has a value for which there are limits on the basis of which there is a classification of market structures. Thus, this paper will cover the four oil companies that we believe influence the concentration in the market mostly. The value of this index ranges from 0 to 100. If its value is 0, then it indicates that it is a market with unlimited number of companies, where the participation of each of them is very small, almost zero. Conversely, if its value is 100, it indicates a market monopoly, that is, a highly concentrated industry. In the United States and the European Union limit value of this ratio is more or less different, but the value that is greater than 25 generally involves a high degree of concentration of supply, given that in the US, highly concentrated market has a value above 50.

Table 3 Concentration ratio - CR4 - *Calculations based on data from Table 1 and Table 2*

Year	CR4	ΔCR
2010	84.7	
2011	83.7	-0.98
2012	84.2	0.47
2013	83.8	-0.46
2014	84.8	1.09



Graph 2 Concentration ratio - CR4

The calculation of the ratio has included only four companies. The practice shows that if the calculation took a larger number of oil companies, concentration ratio would have been inaccurate and it would have lost analytical significance. Measured by the ratio in concentration, and by the standard both of the European Union and the United States, the domestic oil and oil derivatives market is characterized by extremely high concentration. In theory, it is also known that if the value of the concentration ratios is greater than 25, then we are talking about an oligopolistic market. However, if its value is between 25 and 50 then it is a *loose oligopoly*, and if its value is greater than 50, a *tight oligopoly* is in question. As the value of the concentration ratios for the four companies is above 50, oil and oil derivatives market has the title of a *tight oligopoly*. Table 3 and Graph 2 showed

the value movement of CR_4 in the domestic oil and oil derivatives market in the period from 2010 to 2014, whereas as the base for calculations, which were percentage market shares were taken from Table 2 .

All the indicators of concentration, both in this analysis and in general, have certain advantages and disadvantages. For this indicator, the main drawback is that it only shows the total market share of the 4 leading companies in the industry, but not the dispersion of participation among them, which is certainly a major drawback in the detailed consideration of the concentration in a particular market. So, if there are 4 companies in the industry, its value will be 100, the same as if there is only one company. Obviously, when there are only 4 companies within a branch, CR_4 will be set to 100, regardless of the layout of the market share of these four companies. So we can have CR_4=100 for the market in which there are 4 equal sized companies (by revenue), and CR_4=100 for the market when there is only one dominant company with a much larger market share than the other three. This is the reason why we will use several indicators in our analysis.

2.2. The Herfindahl - Hirschman Index of Concentration

The application of **Herfindahl-Hirschman Index of concentration** (hereinafter HHI) provides a clearer analysis of the observed market compared to the previous indicator. This index complements the concentration ratio because it takes into account the difference in size of market share among companies. Also, we consider all the companies operating within the industry into this calculation. Herfindahl-Hirschman Index represents the sum of market shares of the companies weighted by their own market share:

Fig. 3 Herfindahl-Hirschman Index of concentration

$$HHI = \sum_{i=1}^{n} W_i S_i = \sum_{i=1}^{n} (S_i)^2 \tag{3}$$

whereby w_i represents weighting factor and s_i represents market share of the *i* company

Every company is assigned a specific weight corresponding to its market share ($w_i = s_i$). Herfindahl-Hirschman Index is a convex function of market share, and is therefore very sensitive to inequality in the market share distribution (see Figure 3). Herfindahl-Hirschman Index respects market share in the industry, except that it focuses on companies that have higher market share, thus the bigger the number of such companies, the higher the growth of this index. Its value ranges from 0 to 100 or from 0 to 10,000. A more detailed concentration levels are given in Table 4:

Table 4 The levels of market concentration - the value of the Herfindahl-Hirschman Index of concentration

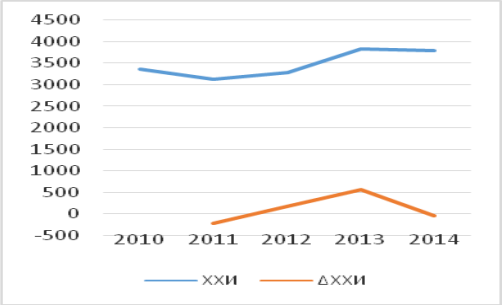
Values of HHI	Degree of supply
HHI < 1,000 (0.1)	Low concentration of supply
1,000 (0.10) < HHI < 1,800 (0.18)	Medium concentration of supply
1,800 (0.18) < HHI < 2,600 (0.26)	High concentration of supply
2,600 (0.26) < HHI < 10,000 (1.00)	Very high concentration of supply
HHI > 10,000 (1.00)	Monopoly

Source: *Market concentration, Global trends and economics, Annual report: Econometric 2009*

Table 5 and Graph 3 illustrate the movement of HHI value in the domestic oil and oil derivatives market for the period from 2010 to 2014, whereby the percentage market share from the Table 2 were taken as the basis for calculation, that is, the percentage market share of seven oil companies that stood out by their turnover.

Table 5 Herfindahl-Hirschman Index
Calculations based on data from Table 1 and Table 2

Year	HHI/ХХИ	ΔHHI/ΔХХИ
2010	3360.4	
2011	3133.1	-227.28
2012	3286.1	153.02
2013	3838.5	552.31
2014	3793.4	-45.01



Graph 3 Herfindahl-Hirschman Index

Herfindahl-Hirschman Index of concentration of market supply of oil and oil derivatives in the Republic of Serbia (without data for Kosovo) in the period from 2010 to 2014 ranged from 3360 to 3794. An offer concentrated like this indicates that from the theoretical aspect, oil and oil derivatives market is characterized by a high level of the limited market. Based on its value, the domestic oil and oil derivatives market is classified as the market in which there is a very high supply concentration by the participants to the supply side. There is a gradual growth of this indicator, indicating the growth of concentration in the domestic oil market. The calculation base is taken from Table 2 - market share percentage and concentration coefficients are calculated from it.

2.3. Uncertainty coefficient

Uncertainty coefficient belongs to the information theory, whose purpose is to evaluate the level of certainty of every decision, and can therefore be used to measure the certainty or uncertainty in different market structures. Uncertainty coefficient focuses on the degree of instability that exists in some branches of agriculture. It is obtained through this form (see Figure 4):

Fig. 4 Uncertainty coefficient

$$E = \sum_{i=1}^{n} S_i \log_e \left[\frac{1}{S_i} \right] \tag{4}$$

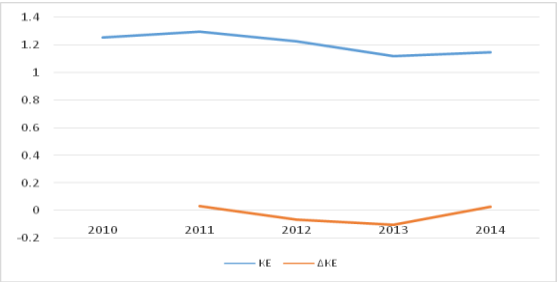
whereby the S_i stands for market share of i company expressed in relative numbers.

If the value of the uncertainty coefficient is zero, then the market situation is monopoly. A company that is monopolistic actually owns the entire market offer and there are no substitutes for its product. If the value of the uncertainty coefficient is equal to the natural logarithm of an n number, where n is the number of companies (companies

of the same size) in the observed market, then its value indicates that it is a market with a perfect competition. The uncertainty coefficient can be decomposed as the uncertainty coefficient within different groups, but also between different groups (Lipczynski, J., Wilson J. and Goddard J. (2009)). Thus, in a situation when there is a group of companies of different sizes, different ownership structures, various industries etc., its practical application comes to the fore. Uncertainty coefficient does not have an upper threshold value and it varies depending on the number of companies in the observed industry.

Table 6 Uncertainty coefficient
Calculations based on data from Table 1 and Table 2

Year	KE	ΔKE
2010	1.257	
2011	1.298	0.034
2012	1.225	-0.067
2013	1.119	-0.105
2014	1.149	0.030



Graph 4 Uncertainty coefficient

Uncertainty coefficient of the domestic oil and oil derivatives market in 2010 amounted to 1.257, while in 2014 its value was much less, amounting only 1.149. From Table 6 and Figure 4, we can clearly see a slight drop, whereby a significant decline was recorded in 2013. Gradually moving away from the coefficient upper limit (1.950) only indicates a further alienation of this market from perfect competition. If we take the value 0 to stand for the market monopoly, and the value 1.950 to stand for the perfect competition, then the value of 1.149 clearly indicates a *tight oligopoly*, as the values of the abovementioned indicators have also confirmed.

2.4. Comprehensive Concentration Index

This index is also known as Horvath Index (Horvath, 1970). Comprehensive concentration index was created as a result of criticism of discrete and cumulative indicators of concentration. Some theorists have criticized this index for giving too much importance to large companies in the industry, while the latter was criticized for underestimating the importance of large companies and attributing the same importance to them as to small companies (Gini coefficient). This index is calculated using this simple form:

Fig. 5 Comprehensive concentration index

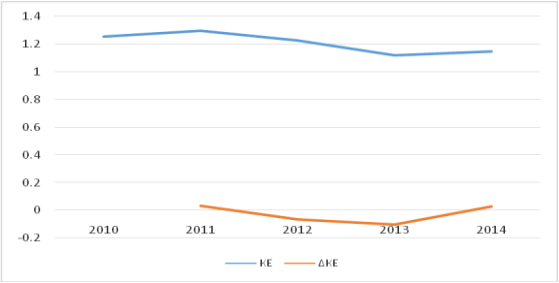
$$CCI = S_l + \sum_{j=2}^{n} S_j^2 (2 - S_j) \tag{5}$$

whereby $i=l$ and $j = 2,3, .. n$ and n - a number of companies in this branch, and S_i and S_j represent market shares of the i and j companies (see Figure 5). Also, S_i represents the

market share of the biggest company, and S_j represents the market share of other companies. This index has primarily been focused on measuring imbalances in the distribution of market share, and is very similar to Lorenz curve and Gini coefficient and that is the reason why these two indicators are not used in this paper.

Table 6 Comprehensive concentration index
based on data from Table 1 and Table 2

Year	ССИ/СИКГ
2010	0.61430
2011	0.59449
2012	0.60533
2013	0.64299
2014	0.64240



Graph 5 Comprehensive concentration index

Table 7 and **Graph 5** represent the movement of index values relating to the relevant oil and oil derivatives market for the period from 2010 to 2014. Apart from the fall recorded in 2011, the index recorded a gradual growth. As the value of this index ranges between 0 and 1, where 0 represents perfect competitiveness and 1 stands for monopoly, the obtained values in the table for the observed period suggest that the existence of a *tight oligopoly* in the relevant market will not be changed suddenly. The potential changes in the market would be appearing gradually and over a longer period of time.

For the oil and oil derivatives market as a whole, all of the applied concentration indicators point to the existence of concentration to some extent. Some of these indicators point to a strong concentration, while others at a moderate concentration. Based on everything abovementioned, we can conclude that there is a tendency towards increasing concentration in the relevant oil and oil derivatives market, but there are no credible evidence that there is an agreement and monopolistic treaty among participants.

CONCLUSION

The tendency to increase the concentration is the result of the increased commitment of oil companies for better business connections and better performance. Situation in the domestic oil and oil derivatives market can be described as oligopoly and due to the certain market relations, it can be characterized as *tight oligopoly*. Therefore, the results of this study suggest that there is an existence of concentration in the relevant market, thus there is a serious possibility for the formation of agreements and arrangements between competitors. *Commission for Protection of Competition* is fully responsible for discovering these arrangements. Namely, if in the near future, the flow of strengthening the concentration in the oil market continues or even becomes stronger, combined with the economic growth and living standards improvement, the abuse of a dominant position is likely to occur.

The problem is further complicated taking into consideration all companies operating in the domestic oil and oil derivatives market. In the observed relevant market, there is an

oligopoly with the dominant firm where one company has a large market power when compared to their competitors in the market. As such, the practice has so far shown that there is a strong possibility that the company will abuse its market position towards suppliers, customers and competitors. This kind of situation in the domestic oil and oil derivatives market is subjected to the anti-monopoly policy of both domestic and foreign legislation. *Commission for Protection of Competition* should pay special attention to the policy of the retail price formation. Appropriate implementation of the regulation for forming prices in the oil and oil derivatives market is only possible under the watchful eye of the *Commission*, because the chances of an agreed performance in the relevant market are really big, which is supported by indicators. In this context, we draw attention to the potential for the agreed performance and the agreed price.

The oil company, which is without a doubt a leader in the domestic oil and oil derivatives market by all accounts is *Petroleum Industry of Serbia*. However, NIS has been a state oil company until recently, so it continues to behave as a company that pursues a responsible policy towards the state budget and society and has not yet misused its dominant position. If the agreement is reached, *tight oligopolies* will achieve maximum of the common benefit that is greater than the individual ones. By connecting several companies, a group of common interest arises and it exceeds all the individual interests. Dominant companies, such as NIS, have lower production costs. They possess advanced technology, quality management, have been present in the market for a long time and have strong support from the government. Also, they have a superior product or service - a product that customers are familiar with for a long period of time and for some specific reasons they are devoted to this product. By connecting multiple companies, a group of common interest arises and it surpasses individual interests.

In order for a company to become a dominant one, it is necessary to have a market share of 40 percent or more. Therefore, the boundary between the monopoly and oligopoly is very faint. The boundary is particularly poorly visible due to the fact that both with monopolists and the dominant firm, the demand curves and their elasticity are pretty similar, but also because of the imperceptibility of the competition of smaller companies.

Pursuant to Article 47 of the Law on Protection of Competition ("RS Official Gazette", No. 51/09) and the Decision of the Council of the Commission adopted in April 2010, *Commission for Protection of Competition* from April 2010 to September 2011 analyzed the overall situation of competition in the market. What was analyzed was import, processing, wholesale and retail trade in the domestic oil and oil derivatives market for the period 2008 to 2010. This analysis had a special significance because the impact of price movements of goods in the market in all economic areas in the Republic of Serbia was really big. Alliance for the *Commission for Protection of Competition* very quickly decided that in the future, an analysis of oil and oil derivatives market in the segment of retail trade and wholesale trade should be conducted for each preceding year. The results of continuous sectoral analysis gave statements, as follows: the Report on the analysis of the market situation, processing, wholesale and retail for the period from 2008 to 2010; the Report on the sectoral analysis of the market, wholesale and retail trade in oil derivatives in 2011; the Report on the sectoral analysis of the market, wholesale and retail trade of oil derivatives in 2012 and the Report on the sectoral analysis of the market, wholesale and retail trade of oil derivatives in 2013. This work, with its own results, clearly supports and complements certain results above mentioned.

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ZAŠTITA KONKURENCIJE NA TRŽIŠTU NAFTE I NAFTNIH DERIVATA REPUBLIKE SRBIJE

Opšte je poznato da tržište predstavlja sveukupni odnos ponude i tražnje. Odnosi ponude i tražnje se stalno prepliću i pod stalnim su uticajem različitih faktora.. U zavisnosti od njihovog odnosa i fakora karakterističnih za određenu ekonomiju javljaju se različita tržišna stanja: monopol, oligopol, ograničeni oligopol, ograničena konkurencija, savršena konkurencija itd. Liberalizacijom domaćeg tržišta nafte i naftnih derivata otvoren je prostor za izgradnju kvalitetnih konkurentskih odnosa. Međutim, tok jačanja konkurentnih odnosa bi trebao da se odvija znatno brže. Tržišna stanja i konkurentnost u praksi su determinisana koncetracijom na posmatranom tržištu. Konkurentnost između privrednih subjekata se na određenom relevantnom tržištu izražava brojnim pokazateljima koncetracije. Prema tome, važan aspekt analize intenziteta konkurencije na domaćem tržištu nafte jeste merenje koncetracije ponude, a što će se u ovom radu i učiniti. Može se slobodno reći da svako tržište karakteriše određeni nivo konkurentnosti između učesnika na tržištu, a kroz konkurentske odnose prožima se i njihova tržišna moć.U radu se pokazateljima koncetracije prikazuje kakva je koncetracija na domaćem tržištu nafte i naftnih derivata, kakve su njegove trenutne odlike i analizira potencijal jačanja konkurentnih odnosa u budućnosti.

Ključne reči: *zaštita konkurencije, tržište nafte i naftnih derivata, pokazatelji koncentracije, koncetracija*.

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EARNINGS MANAGEMENT AND ITS RELATIONS WITH CORPORATE SOCIAL RESPONSIBILITY

UDC 005.35

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Abstract. *The ethics of financial reporting assumes a center stage in the corporate world in the background of an emerging understanding of corporate social responsibility (CSR). We review the literature on the link between earnings management (EM) and CSR and reveal that there are two contradictory perspectives. One perspective assumes that EM is negatively associated to CSR, while the other argues that EM and CSR are positively related. These perspectives are based on the competitive existence theories such as agency, singling, stakeholder, legitimacy theories. While, the negative relationship between EM and CSR perspective is in line with the legitimacy, agency and singling theories, the positive relationship is in accordance with stakeholder theory.*

Key words: *earnings management, corporate social responsibility, stakeholder theory, legitimacy theory, agency theory*

INTRODUCTION

Accounting earnings are one of the most commonly used measures of firm performance. Given that the flexibility of accounting standards provides the executive managers of a firm with considerable opportunities for practicing discretion over reported earnings, it is not surprising that executives manipulate earnings when the interests between them and stakeholders are conflicted. This opportunistic behavior is known in the literature as Earnings Management (EM). It has been acknowledged that the practice of EM may reduce the financial reports' reliability and quality, their usefulness for investment decisions and the shareholders' confidence in financial statements. In addition, EM has a negative impact on a firm such as, losing stakeholders' support, legal actions could be taken by regulators against the firm, the firm's products and services may be boycotted, it is likely to be deemed as illegitimate by the local community and it could be exposed by the media.

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Ultimately, these actions by outsiders may damage the firm's reputation, and could result in the managers losing their jobs.

On the other hand, in the last few decades, the corporate world has been predisposed by the growing awareness on Corporate Social Responsibility (CSR) and become more conscientious on how they generate and expend profits. Currently, firms are more concerned about their ethical and moral behavior, and their relationship with relevant societal interest groups. It has been accepted that firms can gain multiple advantages through building a positive image among the stakeholders, and in establishing social bonds with employees and the local community, which generates reputational gains. In practice, those companies who implement CSR activities are bound to provide transparent and reliable financial information. Some authors demonstrate a commitment to ethical and accountable behavior. However, there is an argument that CSR can be used as an entrenchment mechanism to achieve managers 'self-interest objectives by distorting earnings information.

Hence, the aim of this paper is to review the literature on the link between EM and CSR. The remainder of this paper is organized as follows. Section 1 provides EM background. Section 2 presents background on CSR. Section 3 reviews the literature and relevant theoretical perspectives on CSR and EM. In the last section conclusion is presented.

1. EM BACKGROUND

Accounting earnings are one of the most significant components in the financial reporting to provide information about a company's performance to various stakeholder groups who are interested in the company's activates, such as investors, the government, professional institutions, lenders and employees. Since these various stakeholder groups would not have the authority to access this information compared to firm's insiders, financial reporting is considered as the main resource used by investors to make investment decisions. The revelations of massive accounting scandals involving large corporations (e.g. Enron, WorldCom, etc.) indicate that managers have incentives to use their discretion over reported earnings either to mislead shareholders about the firm's underlying financial performance or to gain some private benefits at the expense of other stakeholders (Healy and Wahlen, 1999). The flexibility of the Generally Accepted Accounting Principles (GAAP) allows managers to use some discretion to estimate reported earnings that might be not accurately reflect the company's underlying economic conditions (Prior et al., 2008). This opportunist behavior of using managers' discretion is known as earnings management (EM).

EM is the process of taking deliberate steps within the constraints of GAAP to bring about a desired level of reported earnings (Davidson et al. 1987). Similarly, Schipper (1989, p.92) states that EM is "a purposeful intervention in the external financial reporting process, with the intent of obtaining some private gains". In addition, Parfet (2000) illustrates that EM is not entirely a bad thing if reasonable and proper practices of EM are used in a well-managed business and deliver value to shareholders. In the same vein, Beneish (2001) indicates that opportunistic and informative are two perspectives of EM. While opportunistic EM seeks either to mislead investors or to secure managers' jobs, reputations, and compensation within the firm, the informative EM aims to provide private information to the investors about the firm's future performance. In order to determine whether EM is opportunistic behavior or

informative exercise, it is important to identify managers' intent. Hence, many attempts have been made in the literature to identify various motivations to manage earnings. However, in some case the opportunistic earnings managing leads to financial fraud, for more see (Marai and Pavlović, 2013).

According to Healy and Wahlen (1999, p. 370), there are three major incentives to manage earnings: capital market, contractual arrangements and regulatory considerations. With regard to capital market, previous capital market literature indicates that issuing equities and beating or meeting analysis' forecasts may motivate managers to manipulate earnings (Chen et al., 2010; Hafzalla, 2009; Payne and Robb, 2000; Healy and Wahlen, 1999). In terms of contractual arrangements, managers have incentives to manipulate reported earnings to influence borrowing and compensation contracts in order to avoid the violation of debt covenants (DeFond and Jiambalvo, 1994) or to gain better bonus rewards (Healy, 1985). As a result of the external pressure from authorities on the firm regarding product prices and market share, mangers may prefer to manage earnings to give the impression that their firms are less profitable than they actually are (Prior et al., 2008). In addition to these motivations, Prior et al. (2008) state that achieving mangers' private gains is one of the main reasons why mangers manipulate reported earnings.

It is worth mentioning that there are two common types of EM: real and accrual-based EM. In terms of real EM, managers can manipulate earnings via modifying corporate transactions, such as reducing expenditures on research and development, advertising, employee training to increase earnings (Guillamon-Saorin and Osma, 2010). Although this type of EM is less likely to be detected by auditors and regulators, it is generally believed to be a more costly form of EM (Hong and Andersen, 2011). On the other hand, accrual-based EM occurs when managers used their judgment to estimate firm's accruals portion without making any changes to real corporate activity such as estimating provisions for dubious accounts and deferring tax assets (Guidry et al., 1999; McNichols and Wilson, 1988). Because this type of manipulation is accounting based, it is generally believed to be a less costly form of EM compared to real EM, and thereby, preferred by managers (Beneish, 2001).

It has been argued that EM is more likely to reduce the financial reports' reliability and quality, their usefulness for investment decisions and the shareholders' confidence in the financial statements (Chen et al., 2010). In addition, Fombrun et al. (2000a) argue that EM has a negative impact on a firm such as losing stakeholders' support, legal actions could be taken by regulators against the firm, the firm's products and services may be boycotted, it is likely to be deemed as illegitimate by the local community and it could be exposed by the media. Such actions by outsiders may damage the firm's reputation, and could result in the managers losing their jobs (Prior et al., 2008). In order to avoid or mitigate opportunistic EM negative consequences, managers have incentives to compensate stakeholders through engaging in Corporate Social Responsibility (CSR) activities.

2. CSR BACKGROUND

According to the classical viewpoint, a firm is only accountable to its shareholders and therefore its role in society is to maximize its economic value, which in turn increases the wealth of its shareholders. Hence, managers' responsibility is to act in the interest of the firm's shareholders and they have no right to engage in social projects that

do not maximize the returns of the business (Friedman, 1962). In general, the classical viewpoint assumes that the only social responsibility of a business entity is to use its resources to engage in activities that increase its profits without resorting to deception or fraud (Friedman, 1962, p.112). However, in the last few decades, the role of corporation has changed as a result of CSR developments. Thus, corporations are now not only accountable for generating profits for shareholders but also have responsibilities in terms of how they generate these profits. Thus, firms have been forced to become more concerned about their ethical and moral behavior as well as their relationship with societal interest groups and their social responsibility (Held, 1970).

Given that CSR is related to complex issues such as environmental protection, human resources management, health and safety at work, local community relations, and relationships with suppliers and customers, engagement in such activities might be costly for firms (Branco and Rodrigues, 2006). However, several incentives have been reported in the literature to motivate CSR implementation in general and motivate companies to implement natural environmental management in particular. For example, Branco and Rodrigues (2006) and Orlitzky et al. (2003) argue that CSR activities assist firms to enhance their transparency and build a positive image among stakeholders, which in turn helps them to gain support from the society in which they operate. According to Fombrun et al. (2000b), a positive image helps managers to establish social bonds between the company, its employees and the local community, and generates reputational gains that improve the firm's ability to attract resources, enhance its performance, and build a competitive advantage. In addition, Fombrun et al. (2000b, p.85) describe five complementary motivations that induce firms to engage in and pursue CSR activities: (1) Build community ties and maintain a license to operate; (2) Increase morale and attachment of current employees; (3) Prepare and attract potential employees; (4) Develop potential customers; and (5) Enact an environment where the company can prosper. Furthermore, Branco and Rodrigues (2006) demonstrate that, by engaging in social activities, firms can gain support from their various stakeholders and obtain more favorable regulatory treatments, endorsements from activist groups, legitimacy from the community, and favorable coverage from the media. Therefore, these activities may help firms to avoid the potentially detrimental impact of government actions. Thus, engaging in corporate social responsibility may have positive impacts on the firm's reputation within society and may enhance the position of the managers within the firm, particularly when they practice their duties in accordance with the principles of CSR.

Despite the advantages of engaging in CSR, it has been argued that managers might have incentives to use CSR activities as a strategic tool to compensate stakeholders influence how they perceive the real future of the firm, distracting attention from any activities that reduces financial reporting quality (Hemingway and Maclagan, 2004). In addition, DeMaCarty (2009) argues that skillful managers may be able to profit personally through measuring CSR, and that this could be the reason for the positive relationship between CSR and financial performance reported in previous studies. As a result, CSR may be adopted by firms in order to create an impression of transparency among the stakeholder groups and then legitimize their activities in order to gain stakeholders support (Kim et al., 2012). From this viewpoint, engaging in CSR activities is driven from opportunistic behavior rather than moral obligations.

3. EM AND CSR PERSPECTIVES

The separation between ownership and control in modern corporations, together with the presence of information asymmetries within companies, spawn the possibility of opportunistic behavior by managers from those of the owners, and hence pursue self-interning objectives (the agency problem) (Prior et al., 2008). Given that managers practice EM either to gain some private benefits at the expense of other stakeholders or to mislead shareholders about the firm's underlying financial performance (Healy and Wahlen, 1999), it has been acknowledge that EM is considered as a type of agency cost because managers look after their own interests by releasing financial reporting that do not reflect an accurate economic picture of the company (Prior et al., 2008). On the other hand, corporate reported information is viewed as a form of monitoring mechanism used by investors and other external users to reduce the information asymmetry problem (Huang and Zhang, 2011). Hence, information disclosed in financial reporting is considered as one of the possible solutions to reduce the agency problem between managers and shareholders (Eng and Mak, 2003).

Theoretically, EM and CSR are linked through two perspectives. First, it has been argued that firms with strong commitments to CSR are less likely to manage earnings since they do not hide unfavorable earnings realizations and, therefore, conduct no EM (Chih et al., 2008). Since EM is perceived as an irresponsible act with CSR principles, Choi et al. (2013) argue that firms with strong commitment to CSR are more prone to act in a responsible way when reporting their financial statements. Likewise, Kim et al. (2012) point out that companies that expend their efforts and resources in designing CSR programs and implement these programs to address the ethical interests of stakeholders follow more transparent and reliable financial reporting and less likely to manage earnings.

Inversely, the second perspective suggests that managers who manage earnings may strategically use CSR information to disguise their opportunistic behavior (Prior et al., 2008). According to Prior et al. (2008), managers who engage in EM may resort to CSR to deal with their stakeholders' activism and vigilance (Prior et al., 2008). In line with this argument, Choi et al. (2013) argue that managers who act in pursuit of private benefits by distorting earnings information are able to entrench themselves through engaging in CSR activities.

Empirically, the studies of Choi et al. (2013); Kim et al. (2012); and Chih et al. (2008) found that EM is negatively related to CSR suggesting that firms with strong commitment to CSR are less likely to engage in EM. On the other hand, several studies have found that EM and CSR are positively related (Gargouri et al., 2010; Prior et al., 2008; Patten and Trompeter, 2003) and suggesting that firms with a higher level of EM resort to CSR activities to disguise managerial opportunistic behavior.

The stakeholder theory offers a beneficial foundation for research into the connection between EM and CSR. According to the stakeholder theory, CSR is seen as obligatory for the firm to discharge wider accountability norms by providing information to relevant stakeholders (Buhr, 2001; Guay et al., 1996). The stakeholder theory is about groups and individuals who can affect or be affected by the organization, and how the organizations manage those groups and individuals (Freeman, 1984). The theory further views that organizations have a duty and obligation to a wider range of stakeholders (Buhr, 2001; Guay et al., 1996) and the managers decisions need to incorporate the

interests of all stakeholders (Grougiou et al., 2014). However, this perspective provides a prescription for how managers can undertake strategies to manage and treat their various stakeholders; it does not have a direct role in predicting managerial behavior in practice (Deegan, 2002). Since the firm is perceived as a multilateral set of relationships amongst stakeholders, Grougiou et al. (2014) indicate that since mangers attempt to attend a multilateral set of stakeholders objectives, the information asymmetry between mangers and stakeholder is high. The existence of information asymmetry provides managers an opportunity to practice EM. Further to this, Hoque (2006) argues that managers manipulate earnings to improve their private interests at the expense of other stakeholders. Moreover, Grougiou et al. (2014); and Sun et al. (2010) illustrate that companies that engage in CSR to negotiate diverse stakeholders interests are inadvertently expected to practice EM. Thus one can assume a positive relationship between EM and CSR in the stakeholder theory framework.

Since the engagement with CSR is one of the management strategies to endorse firm's legitimacy (Grougiou et al., 2014), we looked into the views of the legitimacy theory on our central issue. The legitimacy theory is perceived as a generalized perception that the actions of any entity are desirable within some socially constructed system of norms, values, beliefs and definitions (Suchman, 1995, p.574), argues that an organization activities must be legitimate in the eyes of society if it is to be allowed to continue its operations. Hence, if a company loses its legitimacy, society may revoke its contract and prevent it from continuing its operations (Deegan and Rankin, 1996; Guthrie and Parker, 1989). Various strategies that firms can adopt in order to maintain their legitimacy within the society in which they operate, and all these strategies can be involved to make social disclosure as a means of showing that firms are conforming to society's expectations (Dowling and Pfeffer, 1975). Although a firm may choose CSR to maintain or increase perceptions of its legitimacy (Patten, 1992), it may use this as a means of anticipating or avoiding social pressure as well as enhancing the firm's image or reputational status (Gray et al., 1988). In terms of EM, Sun et al. (2010) indicate that managers who manipulate earnings tend to realize that CSR can be used to maintain the firm's legitimacy, specifically with social and political stakeholders. Thus the CSR is seen as a means of informing stakeholders on the wider interests of the firm and of its accountability which prompts the firm to behave in a socially responsible manner.

It is also possible that managers would be involved in activities that could indirectly harm the company and stakeholders except managers. The separation of ownership and management of a company, together with existence conflicts problem and information asymmetry, could create serious problems because mangers are more concerned about their job security, rewards, ability to remain in power, and to maximize their own wealth (Morris, 1987). Agency problems occur and conflicts arise between managers and owners when the managers act for their own benefits rather than optimizing the firms' value from the stakeholders' viewpoint (Watts and Zimmerman, 1986). Information asymmetry occurs when managers have superior access to the information as compared to the owners (Fields et al., 2001). While managers work in the firm every day and are knowledgeable about all business transactions and affairs, stakeholders, on the other hand, depend on periodic sources of information, such as annual and interim reports to enable them to valuate firm's value. Thus, information asymmetry will be higher if the quality of information is low. Managers could undertake opportunistic EM to achieve their objectives, which in turn, increasing firm's agency cost. Since agency relationships suffer

from the problems of conflict of interest and information asymmetry, an optimal solution should be discovered to control such problems. Several solutions have been introduced in the literature to solve firm's agency problems. For example, Watts and Zimmerman (1986) argue that the transparency and accountability system is one of the solutions that should be put in place in order to avoid agency problems. Jo and Kim (2007) argue that EM occurs less in companies that disclose more information on their social activities, because when the information transparency is increased, it is expected that the information asymmetry between managers and investors will decrease, which will enable investors to detect EM. Likewise, Eisenhardt (1989, p.60) states that "….since information systems inform the principal about what the agent is actually doing, they are likely to curb agent opportunism because the agent will realize that he or she cannot deceive the principal". Similarly, Shleifer (2004) argues that manipulation of earnings occurs less often in corporations with a strong commitment to CSR. In addition, Chih et al. (2008) state that a strong commitment to CSR principles prevents managers from using their opportunistic discretion over earnings.

Finally, in terms of the signaling theory, Gray (2007) illustrates that firms with high-quality information tend to use CSR as an alternative to the classical financial reporting, while low-quality information companies choose non-disclosure, consistent with constrained accounting information. In addition, Gray argues that the quality of company reports is a signal to investors and financial markets that managers are able to control social risks within the company. Likewise, Sun et al. (2010) indicate that corporate environment disclosure as a part of CSR is a signal to investors and other powerful and economic stakeholders that the company is actively taking part in CSR and that its market value is in good condition. According to the signaling theory, a company discloses information to reduce information asymmetry and to signal to investors that it is performing better than its competitors (Álvarez et al., 2008; Miller, 2002). However, Hughes (1986) states that the credibility of information provided by a firm is an essential element in ensuring lower information asymmetry. Given that EM is more likely to occur when information asymmetry is high, the signaling theory assumes that CSR information is used as a means to reduce the information symmetry (agency problem) between companies and their investors. Therefore, based on the notion that CSR information is a useful tool for reducing information asymmetry, prior studies predicted a negative association between CSR information and information asymmetry (Heflin et al., 2005; Brown et al., 2004; Coller and Yohn, 1997; Welker, 1995), which indicates a negative relationship between EM and CSR.

CONCLUSION

The aim of this paper is to review the link between EM and CSR. This review reveals that EM and CSR are linked through two contradictory perspectives. Since EM is perceived as an irresponsible act and inconsistent with CSR principles, the first perspective argues that firms with strong commitment to CSR are more prone to act in a responsible way when reporting their financial statements. On the other hand, the second perspective argues that CSR can be used as an effective tool in dealing with stakeholder activism and vigilance when managers manipulate earnings.

In line with these perspectives, it can be concluded that the empirical previous studies have found mixed and contradictory results. While several studies find that EM and CSR are negatively related, others find that EM and CSR are positively related.

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UPRAVLJANJE DOBITKOM I NJEGOVA VEZA SA KORPORATIVNOM DRUŠTVENOM ODGOVORNOŠĆU

U korporativnom svetu danas, etika finansijskog izveštavanja podrazumeva i razumevanje koncepta korporativne društvene odgovornosti. Istražili smo dostupnu literaturu pokušavajući da uspostavimo vezu između upravljanja dobitkom i korporativne društvene odgovornosti i kao rezultat došli smo do zaključka da su to dve potpuno različite perspektive. Jedna podrazumeva da je upravljanje dobitkom negativno korelirano sa korporativnom društvenom odgovornošću, dok druga dokazuje da su pozitivno korelisane. Ove perspektive su zasnovane na teorijama kao što su agencijska, teorija signala, teorija stejkholdera i teorija legitimnosti. Negativna veza između upravljanja dobitkom i korporativne društvene odgovornosti je u skladu sa teorijom legitimnosti, agencijskom i teorijom signala, dok je pozitivna veza u skladu sa postulatima teorije stejkholdera.

Ključne reči*: upravljanje dobitkom, korporativna društvena odgovornost, teorija stejkholdera, teorija legitimnosti, agencijska teorija*

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