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## IMPACT OF INTELLECTUAL CAPITAL ON FINANCIAL PERFORMANCE OF SERBIAN COMPANIES

***The paper investigates the interdependence between intellectual capital (IC) and its components (human, structural, and physical capital) in relation to the financial performance of Serbian companies. The research used the data from the financial reports of 15 companies with the highest trade rates on the Belgrade Stock Exchange (BELEX) over 2007-2010. The findings show that IC has a positive impact on return on equity (ROE) and a strong impact on employee productivity (EP), but not on return on assets (ROA). The results indicate a need to boost investments in human capital.***

***Keywords:*** *intellectual capital; intangible assets; financial performance.*

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## ВПЛИВ ІНТЕЛЕКТУАЛЬНОГО КАПІТАЛУ НА ФІНАНСОВІ ПОКАЗНИКИ СЕРБСЬКИХ КОМПАНІЙ

***У статті досліджено взаємозалежність між інтелектуальним капіталом (ІК) та його компонентами (людським, структурним та матеріальним капіталом) відносно фінансових результатів сербських компаній. У дослідженні використано дані фінансових звітів 15 компаній з найвищими показниками на Белградській біржі (BELEX) протягом 2007-2010 років. Результати свідчать, що ІК має позитивний вплив на рентабельність власного капіталу та сильний вплив на продуктивність праці, але не на рентабельність активів. Результати підкреслюють необхідність підвищення інвестування у людський капітал.***

***Ключові слова:*** *інтелектуальний капітал; нематеріальні активи; фінансові показники.*

***Форм. 6. Рис. 1. Табл. 5. Літ. 46.***

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## ВЛИЯНИЕ ИНТЕЛЛЕКТУАЛЬНОГО КАПИТАЛА НА ФИНАНСОВЫЕ ПОКАЗАТЕЛИ СЕРБСКИХ КОМПАНИЙ

***В статье исследована взаимозависимость между интеллектуальным капиталом (ИК) и его компонентами (человеческим, структурным и материальным капиталом) относительно финансовых результатов сербских компаний. В исследовании использованы данные финансовых отчетов 15 компаний с наивысшими показателями на Белградской бирже (BELEX) в течение 2007-2010 годов. Результаты свидетельствуют, что ИК имеет позитивное влияние на рентабельность собственного капитала и сильное влияние на производительность труда, но не на рентабельность активов. Результаты подчеркивают необходимость повышения инвестирования в человеческий капитал.***

***Ключевые слова:*** *интеллектуальный капитал; нематериальные активы; финансовые показатели.*

**1. Introduction.** One of the most important global changes at the end of XX century is reflected in the transformation from an industrial to a knowledge-based econ-

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omy. The basic difference between these two is in the position and role of intangible resources in the process of value creation.

It is easy to understand the importance of IC when more than 75% of the market value of successful companies is made up of intangible resources (Kaplan & Norton, 2004b). Value created by effective and efficient use of intangibles is much higher the one created by the use of material assets. In practice, the financial market values IC through the positive difference between a company's market value and its book value (Funk, 2003). However, this positive difference cannot be entirely explained as an effect of appropriate exploitation of the intangible assets of a firm (Garcia-Ayuso, 2003). There is therefore a need for further study of the essence and elements of IC in order to explain its significance in generating augmented value and maintaining the vitality and competitive position of an enterprise.

A number of descriptive studies investigated managers' attitudes to the importance of certain components of IC for business success. According to Roos et al., 2005, 94% of executive managers agreed that it is necessary to understand and manage IC in the correct way. Within this group, 50% described IC management as one of the three most important challenges faced by managers today, with 13% stating that this area represents the biggest challenge of modern management.

**2. Literature review.** IC remains insufficiently defined in the literature. IC is often referred to in the literature as "intangible assets". According to Sveiby (1997), the main elements of IC are employee competencies and internal and external structure. This categorization was expanded with a fourth element – intellectual property (Brooking, 1996). One often-cited classification views IC as the sum of human, organizational, and customer capital (Edvinsson, 1997), and this categorization was used in a number of papers in this field (Edvinsson & Malone, 1997; Bontis, 1998; Sullivan, 1998). Another important IC categorization divides it into innovation (discoveries and knowledge), human resources, and organizational practices (Lev, 2001). In the field of strategic management, mainly due to the works of R. Kaplan and D. Norton (1996, 2001, 2004a, 2004b, 2004c, 2006), the role and importance of IC was placed within the context of the value creation process. The conceptual basis of IC as consisting of human, information, and organization capital is the balanced scorecard, which is the basic tool for strategy formulation and execution. The balanced scorecard approach emphasizes the significance of not only financial but also non-financial measures of corporate success, as well as the necessity for measuring the consequences of IC impact on value creation.

In one of the most cited categorizations in terms of IC (Sveiby, 1997; MERITUM, 2002; Bontis, 2002), 3 components are suggested:

- human capital;
- structural capital;
- relational capital.

Human capital comprises the knowledge and skills of employees, their talents, creativity, enthusiasm, and ability to learn. Structural capital entails components of internal corporate structure: corporate culture, trademarks, patents, software, copyrights, databases, and management processes. Relational capital refers to the numerous relations made with external stakeholders of a company (investors, customers, suppliers, creditors). Examples of relational capital include brands, reputation, customer relations, cooperation with partners, licenses, and distribution channels.

The literature is rich with methods for measuring IC. All these methods can be categorized into 4 large groups (Roos et al., 2005): direct IC methods, market capitalization methods, return on assets (ROA) methods, and scorecard methods. The most important direct methods for measuring IC are Technology Broker (Brooking, 1996), Citation-Weighted Patents (Bontis, 1996), and Value Explorer (Andriessen & Tiessen, 2000). In market capitalization methods, the most significant are Tobin's q (Stewart, 1998), and Market-to-Book Value (Stewart, 1998; Luthy, 1998). The most recognizable ROA methods are the EVA method (Stewart, 1998), Calculated Intangible Value (Stewart, 1998; Luthy, 1998), and Value Added Intellectual Coefficient (VAIC) (Pulic, 1998). Widely known scorecard models include the Skandia Navigator (Edvinsson & Malone, 1997), Value Chain Scoreboard (Lev, 2001), Intangible Assets Monitor (Sveiby, 1997), and Balanced Scorecard (Kaplan & Norton, 1996).

A logical extension of the research would be to analyze the interdependence of IC and corporate performance. Data on companies belonging to S&P500 since the mid-1980s reveal significant increases in market values compared to book values. In March 2000, the level of market-to-book ratio reached its peak. During the same period, the market values of these companies were on average 7.5 times higher than their book values. From August 2002, this ratio dropped to 4.2. The current global economic crisis has caused the "meltdown" of IC in a large number of companies belonging to the group S&P500. On the other hand, further research reveals that the majority of these companies had no significant investments in research and development (new technologies, branding, trademarks). In addition, physical assets investments increased (Lev, 2003).

**3. Hypotheses development.** Hypotheses within the proposed research model were developed according to a number of studies, which, similar to the present study, focused on IC's impact upon company's financial performance (Chen et al., 2005; Firer & Williams, 2003; Goh, 2005; Wang, 2008; Zeghal & Maaloul, 2010; Ting & Lean, 2009; Pulic, 2002; Mavridis, 2004; Kujansivu & Lonnqvist, 2004; Saenz, 2005; Shiu, 2006; Cabrita & Vaz, 2006; Kamath, 2007; Yalama & Coskun, 2007; Seleim et al., 2007; Saengchan, 2008). These studies mostly reveal a positive correlation between the value of IC components and corporate performance. It is also important to emphasize that these studies were undertaken in different economies and markets worldwide.

A few studies use similar research hypotheses, research methodology, and level of economic development at the time of the research. Firer and Williams (2003) conducted research on a sample made up of 75 companies listed on Johannesburg Stock Exchange. The companies belonged to industries that were characterized by high volumes of investments in IC and dependence on the efficient exploitation of IC. This study is particularly interesting since the economy of South Africa was, at the time of the study, in the same stage of transition that the Serbian economy is experiencing today. Further research was undertaken in Taiwan that aimed to provide insight into the relationship between IC (measured by VAIC) and market value and the financial performance of the listed companies (Chen et al., 2005). Another interesting study was conducted (Goh, 2005) presenting the level of IC (also measured by VAIC) in domestic and foreign banks in Malaysia. The findings show that domestic banks were generally less efficient at IC exploitation. A similar study was undertaken among

Egyptian software companies to analyze how human capital affected organizational performance of the selected companies (Seleim et al., 2007). Another interesting study was carried out in Malaysia within the entire financial sector (Ting & Lean, 2009). Its purpose was to determine the impact of IC on financial performance in the financial sector of Malaysia from 1999 to 2007, and VAIC was used as a measure of efficient IC use.

In accordance with previous research in this field and the need to investigate the impact of VAIC on the financial performance of companies in the Republic of Serbia, the following hypotheses are proposed:

1. Companies with higher VAIC tend to have higher ROE:
   1a. Companies with higher HCE tend to have higher ROE;
   1b. Companies with higher SCE tend to have higher ROE;
   1c. Companies with higher CEE tend to have higher ROE;
2. Companies with higher VAIC tend to have higher ROA:
   2a. Companies with higher HCE tend to have higher ROA;
   2b. Companies with higher SCE tend to have higher ROA;
   2c. Companies with higher CEE tend to have higher ROA;
3. Companies with higher VAIC tend to have higher EP:
   3a. Companies with higher HCE tend to have higher EP;
   3b. Companies with higher SCE tend to have higher EP;
   3c. Companies with higher CEE tend to have higher EP;

Figure 1 presents the research model applied to Belgrade Stock Exchange companies.

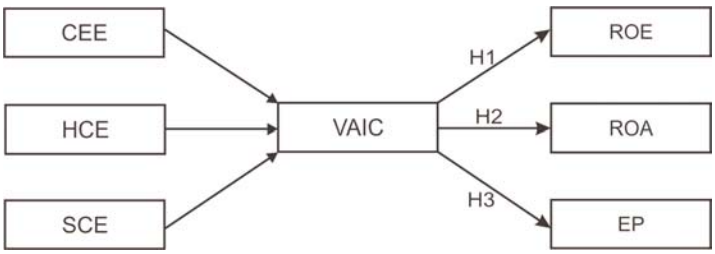


*Figure 1.* **A conceptual model of research**

**4. Methods.** The research was conducted on a sample of 15 companies (6 belonging to the financial sector and 9 belonging to the real sector) over a period of 4 years (2007 to 2010). The selected companies' shares make up a specific index of the Belgrade Stock Exchange entitled BELEX15, which is the BELEX's leading index and illustrates the trends in the share prices with the highest trade rates in the Serbian capital market. The BELEX15 is weighted by market capitalization and calculated in real time. It comprises shares that fulfill "rule 80," which describes shares whose trade rate is a minimum of 80% during each of the last two successive quarters (The methodology for BELEX15 calculation, 2008). It is important to mention that every 6 months there is a regular audit of BELEX15's composition. For the purposes of the present study, financial statements of the companies that made up BELEX15 in 2007 are analyzed. We retained to this sample so that we could accurately compare the data from the period in question. The data for this research were gathered from the official

stock exchange website (www.belex.rs), which publishes financial statements of selected companies.

The present paper uses the model developed and implemented by Ante Pulic (1998, 2004). The starting point of the model is calculation of value added (VA). VA is considered the main indicator of efficient use of IC in a company. The basic idea behind this approach to measuring IC lies in determining the contribution of all the resources of a company (human, structural, physical, and financial) to the creation of VA, which is calculated as follows:

$$VA = OUT - IN.$$

Outputs (OUT) represent total sales realized on the market. Inputs (IN) entail all the costs of managing a company, except for the costs related to human resources. Human resources costs are not viewed as costs in this model but as an investment. Further steps involve calculating intellectual and physical capital efficiency coefficients.

A company's IC comprises human and structural capital. Efficient use of human capital is analyzed through the coefficient of human capitals efficiency (HCE). Calculation of HCE starts with employee salaries and wages, which are not a part of the inputs in this model. HCE is therefore calculated as:

$$HCE = VA/HC.$$

Here, HC denotes total salaries and wages during one fiscal year. In this manner, the model describes the relative contribution of human resources to the creation of VA. Structural capital is made of hardware, software, organizational structure, patents, trademarks, and all other factors that support or increase employee productivity (EP) (Bontis, 2001). Structural capital efficiency (SCE) is calculated by the following equation:

$$SCE = SC/VA.$$

Structural capital (SC) represents the second component of a company's IC. This type of calculation is used because VA is a sum of HCE and SCE. Therefore, SCE is inversely related to HCE (VA=HCE+SCE=VA/HC+SC/VA).

IC efficiency (ICE) is obtained by summing the partial efficiencies of human and structural capital:

$$ICE = HCE + SCE.$$

Finally, the physical capital component, or capital-employed efficiency (CEE), is derived from the ratio of VA to the net assets of a company:

$$CEE = VA/CE.$$

Here, capital employed (CE) represents the capital already invested in a company, its net assets.

In order to enable a comparison of overall value creation efficiency, the two indicators need to be added together as

$$VAIC = ICE + CEE,$$

where VAIC is the value added intellectual coefficient. This aggregated indicator allows understanding the overall efficiency of a company and indicates its intellectu-

al ability. Put simply, VAIC measures how much new value has been created per invested monetary unit. A high value for this coefficient indicates higher value creation using the company's resources.

The VAIC method has certain disadvantages, highlighted chiefly by Andriessen (2004), but it is becoming accepted by an increasing number of researchers as a good indicator of a company's efficient use of IC. Moreover, this method was accepted by the UK Department for Business, Enterprise and Regulatory Reform and the Department for Innovation, Universities and Skills (formerly Department of Trade and Industry) as a measure of IC in companies, thus contributing greatly to the model's validity (Zeghal & Maaloul, 2010).

The research model entails dependent and independent variables. Independent variables are the components of VAIC, HCE, SCE, and CEE. Conversely, the dependent variables selected are ROE, ROA, and EP. Dependent variables are calculated as follows:

- ROE is calculated by dividing pre-tax income by the book value of average stockholders' equity;
- ROA is the ratio of pre-tax income to total assets of an enterprise;
- EP is the ratio of pre-tax income to a total number of employees.

Analysis of the gathered data was conducted by applying statistical methods of correlation and regression. The research model used both single and multiple linear regressions. This was done with the aim of answering the questions: How does VAIC, as an aggregate measure, affect the described dependent variables, and in what way do components of VAIC (HCE, SCE, and CEE) influence selected indicators of corporate success? Single linear regression is used when analyzing the impact of VAIC as an aggregate measure, and multiple regressions were applied when we analyzed the relative impact of HCE, SCE, and CEE on corporate performance. If we relied on the results obtained by single linear regression only, the findings would not be sufficiently analytical, since different components of VAIC affect the financial performance of Serbian companies in different ways.

**5. Findings**

***5.1. Correlation.*** Correlation was used as an initial statistical method in analyzing the relationship between dependent and independent variables of the proposed research model (Table 1).

*Table 1.* **Correlation results**

| | | HCE | SCE | CEE | ROE | ROA | EP |
|---|---|---|---|---|---|---|---|
| HCE | Pearson's Correlation | 1 | .765** | -.030 | .534** | .271* | .890** |
| | Sig. (2-tailed) | | .000 | .821 | .000 | .036 | .000 |
| SCE | Pearson's Correlation | .765** | 1 | .153 | .663** | .480** | .672** |
| | Sig. (2-tailed) | .000 | | .245 | .000 | .000 | .000 |
| CEE | Pearson's Correlation | -.030 | .153 | 1 | .235 | .214 | -.218 |
| | Sig. (2-tailed) | .821 | .245 | | .071 | .101 | .104 |
| ROE | Pearson's Correlation | .534** | .663** | .235 | 1 | .722** | .535** |
| | Sig. (2-tailed) | .000 | .000 | .071 | | .000 | .000 |
| ROA | Pearson's Correlation | .271* | .480** | .214 | .722** | 1 | .305* |
| | Sig. (2-tailed) | .036 | .000 | .101 | .000 | | .021 |
| EP | Pearson's Correlation | .890** | .672** | -.218 | .535** | .305* | 1 |
| | Sig. (2-tailed) | .000 | .000 | .104 | .000 | .021 | |

* Significance level 0.05; ** Significance level 0.01

The results indicate that HCE has a strong correlation with EP, while the correlation coefficient in the case of ROE is lower (with a significance level of 0.01). HCE also has a positive correlation with ROA, but the correlation coefficient is much lower, with a level of significance of 0.05, which suggests the strongest relation between HCE and EP. In the case of SCE, there is moderate to good correlation with ROE and EP, while the correlation with ROA is lower. As far as CEE is concerned, there is no significant correlation with dependent variables in the research model (Table 1).

***5.2. Results of single linear regression analysis.*** Table 2 shows the results of single linear regression analysis, where VAIC is an independent variable, and ROE, ROA, and EP are dependent variables. We can see that VAIC has the strongest impact on changes in EP ($R^2$=0.777, significance level <0.05).

*Table 2.* **Results of single linear regression analysis (independent variable: VAIC)**

| Variable | $R^2$ | β | T | Significance level |
|---|---|---|---|---|
| ROE | 0.315 | 0.561 | 5.164 | 0.000 |
| ROA | 0.089 | 0.299 | 2.384 | 0.020 |
| EP | 0.777 | 0.882 | 13.854 | 0.000 |

On the basis of the results of single linear regression analysis presented in Table 3, we were able to prove the positive impact of VAIC on selected performance indicators. Nevertheless, VAIC explains only 8.9% of changes in ROA, while $R^2$ in the case of ROE is 0.315, which means that changes in VAIC explain 31.5% of changes in ROE.

***5.3. Results of multiple linear regression analysis.*** Because VAIC is a coefficient made up of 3 separate coefficients (HCE, SCE, and CEE), it is necessary to deepen the analysis by investigating the impact of VAIC components on selected measures of corporate performance. The VAIC consists of the coefficient of ICE (the sum of HCE and SCE) and the coefficient of CEE. Tables 3, 4, and 5 present the results of multiple regression analysis.

*Table 3.* **Results of multiple regression analysis (dependent variable: ROE)**

| Variable | β | T | Significance level |
|---|---|---|---|
| HCE | 0.120 | 0.771 | 0.444* |
| SCE | 0.548 | 3.469 | 0.001** |
| CEE | 0.155 | 1.523 | 0.133* |

Significance level p<0.01 (**); p<0.05 (*); $R^2$ = 0.464; F = 16.150; significance = 0.000.

Table 3 reveals that the value of ROE is strongly affected only by the component of structural capital (p<0.01), while the influence of human and physical capital components is marginal. It is important to note that in 46.4% of cases the changes in the value of ROE can be explained by changes in VAIC.

*Table 4.* **Results of multiple regression analysis (dependent variable: ROA)**

| Variable | β | T | Significance level |
|---|---|---|---|
| HCE | -0.190 | -1.040 | 0.303 |
| SCE | 0.607 | 3.286 | 0.002** |
| CEE | 0.115 | 0.969 | 0.337 |

Significance level p<0.01 (**); p<0.05 (*); $R^2$ = 0.264; F = 6.711; significance = 0.001.

Table 4 presents the results of multiple linear regressions where ROA is a dependent variable. In the case of Serbian companies, 26.4% of changes in ROA are the result of changes in components of VAIC ($R^2$=0.264), with only structural capital component having a significant impact on ROA. This is similar to the case of ROE in Table 3.

*Table 5.* **Results of multiple regression analysis (dependent variable: EP)**

| Variable | β | T | Significance level |
|---|---|---|---|
| HCE | 0.858 | 9.246 | 0.000** |
| SCE | 0.031 | 0.329 | 0.744 |
| CEE | -0.183 | -3.082 | 0.003** |

Significance level $p<0.01$ (**); $p<0.05$ (*); $R^2 = 0.825$; $F = 83.192$; significance = 0.000

When EP is a dependent variable, the situation is reversed compared to those presented in Table 4. Structural capital does not have a significant impact on EP, since the significance level is 0.744. On the other hand, HCE determines the level of EP. The same occurs with CEE, but this relation is inverse since β equals -0.183 (Table 5).

From the results of correlation and single and multiple regression analysis, we define the level at which our research hypotheses are confirmed. The result of single linear regression indicates that hypotheses 1, 2, and 3 are confirmed. However, this conclusion is questionable since the value of $R^2$ varies significantly depending on the dependent variable being analyzed. With this in mind, the best research model is single linear regression with EP as the dependent variable, while the worst is the research model describing the relationship between VAIC and ROA.

The results of multiple linear regressions verify research hypotheses 1b, 2b, 3a, and 3c. On the other hand, from the results we were not able to confirm hypotheses 1a, 1c, 2a, 2c, and 3b.

**6. Discussion and conclusion.** The increasing importance of IC and its role in creating and enhancing competitive advantage is unquestionable in developing countries such as Serbia; IC is therefore an important topic of future research (Firer & Williams, 2003).

The study fails to confirm the existence of a strong positive correlation between VAIC and corporate performance measured by ROE, ROA, and EP. The overall results may be summarized through several important remarks. Firstly, correlation results indicate the high level of interdependence between EP and human capital, which entails employee knowledge and skills, training, talents, level of creativity, enthusiasm, and ability to learn (the correlation coefficient is 0.89, with a significance level of 0.01). This is a highly logical conclusion. The volume of investments in specific knowledge and skills boosts EP, which in turn has a positive effect on overall company productivity. Secondly, correlation analysis reveals a statistically significant relationship between structural capital and all the dependent variables. The structural capital is made up of corporate culture and working conditions, trademarks, various patents, software, copyrights, databases, management processes, and organizational structure (correlation coefficients for ROE, ROA, and EP were 0.663, 0.480, and 0.672, respectively). This suggests that economic performance is highly dependent on all the immaterial components of business except for human capital. Based on

this, we can conclude that successful Serbian companies derive their competitive advantage primarily from the components of structural capital and not from employee knowledge and skills. Thirdly, the component reflecting physical capital exhibited a weak relationship with the analyzed performance indicators. In the case of EP, there was a negative correlation coefficient (-0.218).

The results of multiple regression analysis lead to interesting conclusions. Firstly, in determining the nature and form of the relationship between ROE and ROA, and changes in the level of VAIC, only the elements of structural capital influence changes in the value of ROE. Secondly, EP is highly dependent on investments in employee knowledge and skills, as well as on investments in physical assets.

Today, Serbian economy reflects a situation in which corporate performance depends less on the knowledge and skills of employees. In other words, indicators of corporate performance are still reliant on physical assets, an ability to organize employees properly, existing branding and image, patents and licenses, copyrights, databases, and other components of structural capital. We can therefore conclude that corporate success in Serbian economy is achieved by domestic companies that have strong brands and by large foreign corporations that entered Serbian market primarily by means of an external growth method and brought their existing elements of structural capital. Future growth and development of Serbian economy must have its foundations in human capital investments, primarily in the field of new knowledge and skills.

The research results presented here may be a good starting point for further exploration of this field. For example, the results of this study are relatively general since they entail companies from various industries. Despite the obvious limitations, our results provide a clear and useful indication of the relationship between IC and traditional measures of corporate performance in an economy that is still in a stage of transition.

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