THE INFLUENCE OF INTELLECTUAL CAPITAL ON THE PERFORMANCE OF SMALL AND MEDIUM IT ENTERPRISES

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Research work

Abstract: This paper examines the impact of intellectual capital on the performance of small and medium IT companies operating in the Republic of Serbia. The research was conducted on the example of 112 IT companies, using panel data analysis, in such a way that the data was collected from the balance sheet and success of IT companies for the period from 2013 to 2020. The primary goal of the research is to determine the importance and impact of intellectual capital on the performance of IT companies, since this is a sector based on the 5th industrial revolution. An additional goal of the research is to answer the question of which element of intellectual capital has the greatest impact on the success of small and medium IT companies in the Republic of Serbia. The results of the research indicate that intellectual capital has an impact on the business performance of IT companies in human and engaged capital. Research has found that structural capital has a negative impact on business performance.

Introduction

The expansion of the IT sector in the Republic of Serbia in the last ten years is evident. The share of this sector in the total gross domestic product is over 10% and the trend of its increase will continue in the future. These tendencies are also implied by

the measures of the Government of the Republic of Serbia aimed at supporting the development of small and medium enterprises in the IT sector, [VRS, 2016] as well as the recently adopted Strategy for the Development of the IT Sector. According to the data of the Business Registers Agency in the Republic of Serbia, today there are about 2.349 active IT companies, of which over 95% are small and medium enterprises, which are obliged to keep business books. Until the Decree of the Government of the Republic of Serbia in 2021, a large number of IT companies were registered as entrepreneurial activities and as such, as a rule, were not subject to the obligation to keep business books.

Although in the conditions of modern business, human resources are crucial for the success of every company, [Stathis, 2015] regardless of the branch of industry in which it operates, the specificity of the IT sector makes this factor of production crucial for the success of IT companies. That is why today the competition between small and medium IT companies in the Republic of Serbia takes place primarily through the engagement of the highest quality staff and their permanent training. Intensive

growth of this sector has influenced the demand for quality IT professionals to be very high because they realized that achieving high business performance depends primarily on the efficiency of intangible assets, and especially human resources. In other words, primarily small and medium-sized IT companies have recognized that human resources are one of the most important sources of competitive advantage in the IT sector.

However, other factors of production, i.e. business determinants, such as the image and reputation that the company has on the market, the quality of connections, relations and relationships it establishes with external stakeholders, the quality of the organization within the company, i.e. organizational climate and culture, manner and degree of efficiency of physical activity exploitation, etc. affect business success. As all these determinants are sublimated through the elements of the intellectual capital of the company (IC), hence the need to study its impact on business performance. Examining the impact of IC on business performance was predominantly related to other sectors of the tertiary sector, primarily the financial sector.

This is evidenced by the works of numerous authors, such as [Al-Musalli & Ku Ismail, 2014; Kaupelytė & Kairytė, 2016; Jafarnezhad & Tabari Yadollah-zade, 2016; Meles et al., 2016;, Ozkan et al., 2017; Javed & Jahan, 2017; Tran & Vo, 2018] and others. Interestingly, these authors do not have unified views on the importance of the impact of different elements of IC on the success of financial organizations, which they studied. For example, Ozkan et al. [2017] found that physical and financial capital (CEE) and human capital (HCE) have a positive impact on banks' financial performance, but that CEE has a greater impact than HCE. Similar findings were presented by Meles et al. [2016], Lu et al., [2014], Hidayat et al., [2016], but they state that HCE is the element of IC that has the greatest impact on business performance. Ikapel [2016] points out that HCE has no influence and also states that CEE is the most important element of IC. However, in contrast, Teck et al. [2018] point out that structural capital (SCE) is the most important element of IC that affects business performance. It is similar with the findings from other branches. Thus, the research conducted by Ivanovic et al. [2021] on the example of agricul-tural enterprises shows that SCE has a negative impact on the success of these enterprises in the Western Balkans. Xu et al., [2020] state that CEE is the most important element of IC that influences the success of agricultural enterprises. This finding is consistent with the results of research by Janda et al. [2013]; Kadocsa & Francsovics [2011]. Studying the impact of IC on the performance of small and medium enterprises, Xu & Li [2019] noted that the importance of IC, or its elements, depends on whether the company operates in the high technology sector or not. In support of the fact that the impact of IC and its elements depends on the type of sector to which the company belongs is confirmed by the results of research [Bontis et al., 2000; Lim & Dallimore, 2004; Vishnu & Gupta, 2014; Urbanek, 2016; Al-Musalli & Ku Ismail, 2014; Meles et al., 2016; Khalique et al., 2019; Bornemann & Wiedenhofer, 2014; Poh et al., 2018; Peng et al., 2007; Hidayat et al., 2016]. Based on the findings of these studies, it can be concluded that the impact of IC and its elements depends on the sector and the characteristics of the macroeconomic environment in which the company operates.

Since there are few researches that have studiously analyzed the impact of IC on the performance of small and medium IT companies, and especially those that have studied it on the example of IT companies operating in the Republic of Serbia, the study of this research subject is justified. The aim of this paper is to determine the importance of IC, as well as its elements on the performance of small and medium IT companies.

1. Empirical Research

This part of the paper presents the results of the original empirical research on the impact of IC on the performance of small and medium IT companies operating in the Republic of Serbia. The focus is on finding answers to the questions of the impact of IC on the success of IT companies in the Republic of Serbia, as well as to determine which of its elements has the greatest impact.

The research includes a sample of 112 small and medium-sized IT companies, which submitted financial reports to the Business Registers Agency in the period from 2014 to 2020.

1.1 Variables and research methodology

Bearing in mind the allegations of Chandler & Hanks [1996]; Perren [2000]; Namiki [2011]; Curcic et al. [2020], that an organization can be successful only if it makes a profit, and that therefore profitability is the only true measure of business success, for the purposes of this paper, the business performance of small and medium IT companies is expressed through the rate of profitability. Data were collected based on the income statement of selected companies. There are many ways in the literature to express IC. However, the dominant way is by applying the so-called VAIC method proposed by Pulić. Namely, starting from the premise that traditional measures of company business performance, such as cash flows, profit, market shares, etc. do not provide reliable information on whether a company really creates value for its stakeholders, and that the ability to create added value is a reflection of business success, Pulić [2000] proposed a new way to measure efficiency by which intangible

assets contribute to tangible business results. VAIC is based on the concept of added value [Laing et al., 2010, 269–283] and measures the efficiency of intellectual capital through the coefficients of efficiency of human capital (HCE), structural (SCE) and employed capital (EEC), which consists of the efficiency of physical and financial capital, which can be mathematically represented as follows: [Mohamed, 2017]:

$$VAIC = HCE + SCE + CEE \quad (1)$$

$$HCE = \frac{VA}{HC} \quad (2)$$

$$SCE = \frac{VA - HC}{VA} \quad (3)$$

$$CEE = \frac{VA}{CE} \quad (4)$$

Where:

VA = Value added - sum of operating profit, labor costs, written off value and depreciation

HC = Plate and other personal income

CE = Physical and financial capital

HEC = Human capital efficiency

SCE = Efficiency of structural capital

CEE = Efficiency of employed capital

Based on expression (1), it can easily be concluded that the efficiency of IC is the sum of the efficien-cy of the use of human, structural and invested capital. Since each of the coefficients of efficiency of the IC elements requires being determined sepa-rately, this determination of the efficiency of the IC using the VAIC model involves the calculation of several variables and coefficients. For the purposes of this paper, it is calculated through the seven steps shown in Table 1. VAIC method.

Table 1. VAIC method

Steps	Variables	Formula	Variables operationalized
1.	Value added (VA)	VA=OP/EC=D=A	OP= operating profit
2.	Intellectual capital (IC)	IC=EC+SC	EC= Employee cost
3.	Human capital efficiency(HEC)		D=Depreciation
4.	Efficiency of structural capital (SCE)		A=Amortization HC=Human capital
5.	Efficiency of employed capital (CEE)		SC=VA-HC CE=Book value of net assets
6.	Intellectual capital efficiency (ICE)		
7.	Value added Intellectual coefficient (VAIC)		

Source: Authors

The main reason why this method of expressing IC is very popular is that it belongs to the so-called impartial methods that are free of the subjectivity of the examiner. [Abdulsalam et al., 2011] Namely, the method shows the extent to which intellectual capital contributes to the business performance of the company compared to tangible assets, and data are collected based on the company's balance sheet. The fact that data on IC, as well as data on business performance are collected on the basis of the same financial statements, Kozera [2016] especially emphasizes the advantage of this method. Andriessen [2004] states that the advantage of the method is that the data published in the financial statements are publicly available and it is quantitative data, so they are free from any bias and subjectivity of researchers, which is not the case when other methods for measuring IC are applied. Among the many advantages is that this method allows easy comparison of results between companies

from different sectors and industries. Since the value of VAIC can be understood as an indicator of a company's success, its value can be easily interpreted. Namely, the higher its value, the greater the company's ability to create added value for its stakeholders. [Fijalkowska, 2014]

Authors such as Ivanović et al., [2021] state that the main limitation of the method is that it is based on historical data, which represents a reflection of previously made decisions. Based on them, only certain forecasts of the impact of IC on the success of the company's business in the future can be made. Radivojević & Makuljević [2022] state that the main disadvantage of this method is that it does not take into account the synergistic effect between the elements of IC, but treats the impact of each of them, while any key limitation of the method is the inability to consider relational capital IT element.

The authors especially emphasize this shortcoming.

Based on expression (1), it can be easily concluded that according to the VIAC method, the efficiency of intellectual capital is measured through the coefficients of efficiency of human capital (HCE), structural (SCE) and employed and physical capital (EEC). For this reason, these coefficients were used as indicators for human, structural and physical capital, as elements of IC. In other words, HCE, SCE and EEC were used as independent variables in model (5), which is presented in detail below.

1.2. Econometric model for assessing the impact of IC on the performance of small and medium IT enterprises

For the purpose of this research, the following econometric model was developed, which is represented by expression (5):

$$RPf_{i,t} = \beta_1 + \beta_2 HCE_{i,t} + \beta_3 SCE_{i,t} + \beta_4 CEE_{i,t} + \beta_5 RPF_{i,t-1} + \varepsilon_{i,t} \quad (5)$$

Where:

$RPf_{i,}$ = Profit rate of the i-th enterprise at the moment (t)

$RPf_{i,t-1}$ = Profit rate of the i-th enterprise at the moment (t-1)

$HCE_{i,t}$ = Coefficient of human capital efficiency of the i-th enterprise at the moment (t)

$SCE_{i,t}$ = Coefficient of efficiency of structural capital of the i-th enterprise at the moment (t)

$CEE_{i,t}$ = Coefficient of efficiency of employed capital (EEC) i-th company at the moment (t)

β_i = Model coefficients

$\varepsilon_{i,t}$ = A random error of a model that is assumed to follow an identical and independent distribution.

It is a dynamic panel data model, in which the dependent variable from the previous period is included in order to determine the impact of profitability from the previous period on the current profitability of the company. Due to the possible problem of endogeneity, i.e. the possible problem of multicollinearity, the values of the VAIC coefficient are not included in the model, but only variables representing the elements of IC.

Since this is a dynamic panel data model that includes a dependent variable from the previous period as a regressor, and for that reason it is possible that it is correlated with model error, which leads to the problem of bias in estimating model parameters (5) used the GMM evaluator presented by Arellano & Bond [1991]. The GMM estimator is based on the transformation of the first order model (5), it can be said that the following model was used in the paper:

$$\Delta RPf_{i,t} = \beta_1 + \beta_2 \Delta HCE_{i,t} + \beta_3 \Delta SCE_{i,t} + \beta_4 \Delta CEE_{i,t} + \beta_5 \Delta RPF_{i,t-1} + \varepsilon_{i,t} \quad (6)$$

As the goal is to find a valid instrument that is highly correlated with the profit rate from the previous period, and at the same time not with the model error, the Sargan test is used for the validity of the application of the selected evaluator.

2. Analysis of Obtained Results

In this part of the paper, the results of the evaluation of model parameters (6) using GMM evaluators are presented. Table 2 shows the results of descriptive statistics.

Table 2. Results of descriptive statistics of selected variables

	HCE	SCE	CEE	VAIC	RPf
Mean	2.114	0.898	0.470	2.930	0.255
Mode	-0.368	0.788	0.151	3.333	0.004
Standard Deviation	2.256	2.877	0.484	3.668	0.336
Kurtosis	10.341	201.773	10.873	65.871	3.512
Skewness	0.491	12.036	-0.249	4.882	0.551
Range	23.339	59.658	6.111	59.954	2.593
Minimum	-10.186	-10.606	-3.003	-11.144	-1.413
Maximum	13.153	49.052	3.108	48.811	1.179
No. Obs.	784	784	784	784	784

Source: Authors

The average value of the profit rate in the observed period is 0.225%, which indicates that IT companies in the observed period achieved positive results on average. Negative values; the minimum value of this variable reveals that there are companies that left negative business results during the observation period, i.e. incurred losses. The relatively high values of the standard deviation of this variable indicate that, despite the fact that this sector is highly profitable, there are still significant differences in the performance of IT companies in the Republic of Serbia. The positive value of the asymmetry coefficient with extra curator indicates a higher probability of achieving positive results of these companies in the future. The positive average values of all three elements of IC indicate that small and medium-sized IT companies in the Republic of Serbia have used IC effectively on average. However, the high values of standard deviations reveal that there are significant differences in this among IT companies, i.e. the negative minimum values of these coefficients indicate that there are companies that were inefficient in the use of IC. The obtained values of these coefficients are somewhat lower compared to the values presented by numerous authors who studied the impact of intellectual capital in other sectors of the economy (see Joshi et al. [2013]; Al-Musalli & Ku [2014]; Javed & Jahan [2017] etc.).

Since the valid application of panel analysis requires that the data series be stationary, the LLC test was used for the purposes of testing the stationarity of the panel data. The results of this test are shown in Table A1 in the appendix. As can be seen from Table A1, all variables are stationary at the basic level. This finding is a bit surprising when it comes to the rate of return. It is common that it shows the properties of non-stationarity, but having in mind the expansion of the IT sector in the Republic of Serbia, the series of these data shows the properties of stationarity.

Also in the paper, the correlation matrix is given in Table A2, which clearly shows that there is no significant correlation between the elements of IC, which avoids the potential problem of multicore linearity.

The results of the evaluation of the model parameters (6) are shown in Table 3.

Table 3. Estimates of model parameters (6)

Model (6): 1-step dynamic panel, using 770 observations				
Included 7 cross-sectional units				
H-matrix as per Ox/DPD				
Dependent variable: RPf				
	coefficient	std. error	z	p-value
RPf(-1)	0.108	0.072	1.499	0.134
const	0.000	0.000	0.965	0.335
HCE	0.015	0.003	5.380	0.000
SCE	-0.016	0.008	-2.132	0.033
CEE	0.143	0.031	4.655	0.000
Sum squared resid	87.392	S.E. of regression	0.338	
Number of instruments = 742				
Test for AR(1) errors: z = -2.08694 [0.0369]				
Test for AR(2) errors: z = 1.84733 [0.0647]				
Sargan over-identification test: Chi-square(737) = 729.004 [0.5760]				
Note: ***, **, * indicate significance on 1%, 5% and 10% respectively. Dummies for time effects are allowed.				

Author's calculations

As can be seen from Table 3, the value of the Sargan test for over-identification of instruments indicates that the selected instruments are valid. Also, the value of first- and second-order auto-correlation tests are expected, which implies that the model is well specified.

2.1. Discussion of the obtained results

Based on the results of the evaluation of the parameters shown in Table 3, the following conclusion can be drawn:

1) That the profit rate from the previous period does not affect the success of small and medium IT companies in the Republic of Serbia;

2) That there is a positive and significant correlation between business performance, profit rate and efficiency of human capital use. Namely, any increase in the value of the HCE variable of 1% will cause an increase in the company's profit rate by 0.015%. This finding indicates the importance of nurturing and developing human capital. This is particularly important to understand given the results of a survey conducted by Osiniksi [2017], according to which demand for human resources is growing at a rate of 9-11%, while supply is growing at a rate of 6 -7%.

3) That there is a negative and significant correlation between business performance and the efficiency of the use of structural capital. Any increase of 1% in the value of the SCE variable will lead to a decrease in the profit of IT companies by about 0.016%. This finding is in line with the results of research by Ivanović et al. [2021]. The reason for this may be found in the fact that IT companies are constantly growing and expanding due to the increase in business, so that new organizational forms and structures, as well as the relationships established on that occasion are either not adequate or still do not give the expected results.

4) That there is no statistically significant relationship between business performance and efficiency of the use of capital employed. The significantly higher value of the coefficient with this variable implies that CEE is a more significant factor in the success of IT companies' operations compared to human capital, despite a different belief.

By obtaining such results from the evaluation of model parameters (6), it can be concluded that IC has an important role in achieving the success of small and medium IT companies operating in the Republic of Serbia. This impact can beseen in the positive impact of human and engaged capital, but also in the negative impact of structural capital. Since the expression of IC through the VAIC method does not allow us to see the synergetic effect, it is difficult to say whether and to what extent the positive effects of human and engaged capital outweigh the negative effects of structural capital. Only on the basis of observing the value of parameter estimates with these variables can it be said that IC has a positive impact, overall, on the performance of small and medium-sized IT companies.

Conclusion

The paper examines the importance and impact of IC on the performance of small and medium IT companies. The research was conducted on the example of 112 IT companies operating in the Republic of Serbia, using panel data analysis. The panel includes balanced data, which were collected from the database of the Business Registers Agency, for the period from 2014 to 2020. A GMM estimator was used to evaluate the model, since the dependent variable from the previous period was included in the model as a regressor. The aim was to examine its impact on the current profitability of IT companies. IC is expressed using the VAIC method. More precisely, the elements of IC used as regressors expressed by the coefficients of efficiency of the use of human, structural and engaged capital were used as regressors.

The analysis of the obtained results indicates that among IT companies there are significant differences in the achieved business results. Despite the fact that this is a profitable sector that is recording a growth trend, some IT companies during the observed period recorded negative business results. Regarding the efficiency of IC use, data analysis shows that all IT companies were more or less efficient in its exploitation. However, the analysis of the evaluation of the model parameters indicates that not all elements of IC have a positive impact on the business performance of IT companies. The analysis shows that the capital employed is the most influential. The higher value of

the parameter estimates with this variable compared to the value of the parameter estimate with the variable representing human capital indicates that this element of IC is more important for business success in small and medium IT companies operating in the Republic of Serbia. On the other hand, structural capital has a negative impact. This find-ing is not surprising because the authors who studied the impact of IC on the business results of companies from different indus-tries indicate its negative impact. One of the reasons for this can be found in the fact that due to the permanent growth of IT compa-nies, organizations are either in-adequately changing or still not giving the right results.

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APPENDIX:

Table A1. LLC test results

Variable		LLC test
RPft	Level	0.000
	1. Differential	-
RPft-1	Level	0.000
	1. Differential	-
HCE	Level	0.000
	1. Differential	-
SCE	Level	0.000
	1. Differential	-
CEE	Level	0.621
	1. Differential	0.000***

Source: Authors

Table A2. Correlation matrix

	HCE	*SCE*	*CEE*	*RPf*
HCE	1.000			
SCE	-0.026	1.000		
CEE	0.381	-0.010	1.000	
RPf	0.250	-0.002	0.513	1.000

Source: Authors

UTICAJ INTELEKTUALNOG KAPITALA NA PERFORMANSE POSLOVANJA MALIH I SREDNJIH IT PREDUZEĆA

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Rezime: U radu se ispituje uticaj intelektualnog kapitala na performanse poslovanja malih i srednjih IT preduzeća, koja posluju u Republici Srbiji. Istraživanje je sprovedeno na primeru 112 IT preduzeća, primenom analize panel podataka, na taj način što su podaci prikupljani iz bilansa stanja i uspeha IT preduzeća za period od 2013. do 2020. godine. Primarni cilj istraživanja jeste da se utvrdi značaj i uticaj li intelektualnog kapitala na performanse IT preduzeća, budući da je reč o sektoru koji se zasniva na 5. industrijsko revoluciji. Dodatni cilj istraživanja jeste da se odgovori na pitanje koji element IK ima najveći uticaj na uspeh poslovanja malih i srednjih IT preduzeća u Republici Srbiji. Rezultati istraživanja ukazuju da intelektualni kapital, iskazan kroz elemente VAIC metode ima delimičan uticaj na performanse poslovanja etno sela, jer su samo dva njegova elementa značajna: ljudski kapital i strukturni kapital, dok fizički kapital nema statistički značaj.

Ključne reči: Intelektualni kapital, VAIC metoda, mala i srednja preduzeća, IT sektor, panel analiza.