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INTELLECTUAL CAPITAL AND PROFITABILITY: STATE AND PERSPECTIVES OF INSURANCE COMPANIES IN SERBIA

SCIENTIFIC WORK

Abstract

The knowledge-based era requires an increasing application of intellectual capital in knowledge-intensive activities, such as the insurance industry, to gain sustainable competitive advantage and profitability. The paper aims to determine the contribution of intellectual capital and its components to the profitability of insurance companies in Serbia. The research includes 16 insurance companies in Serbia from 2018 to 2022. Regression analysis was used to test the research hypotheses. The results show that intellectual capital contributes to the profitability of insurance companies, but physical capital still has a dominant influence on profitability. The analysis of intellectual capital components shows that human capital has a greater contribution than structural capital.

Key words: *intellectual capital, profitability, insurance companies*

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I Introduction

The monetary industry, which includes insurance, represents an industry intensified by knowledge, where more intellectual than physical resources are used for the realization of their activities⁴. The goal of the monetary authorities is to improve the efficiency and effectiveness of this sector, which will contribute to economic growth through strengthening financial stability⁵. The insurance sector in Serbia achieved growth in insurance premiums in 2023⁶, which indicates the development potential of this sector⁷. It should also be added that Serbia lags behind the countries of the European Union when it comes to the share of premiums in the value of the gross domestic product⁸.

In today's dynamic business world, insurance companies must focus on monitoring changes in business performance⁹ and the causes of these changes. In support of this, the authors¹⁰ state that insurance companies are increasingly facing price sensitivity and, therefore, low profitability. Considering the knowledge-intensive nature of the insurance sector, intellectual capital is recognized as a key factor in introducing changes in companies and creating satisfactory business results. Thus, the process of intellectual capital allocation and planning becomes central to insurance companies¹¹, so it is necessary to develop new, more advanced intellectual capital management strategies¹². Effective allocation of intellectual resources can provide insurance companies with an advantage and thus sustainable business in the future¹³. Accordingly, the paper aims to determine the contribution of intellectual capital and its components to the profitability of insurance companies in Serbia.

⁴ Alipour Mohammad, "The effect of intellectual capital on firm performance: an investigation of Iran insurance companies", *Measuring Business Excellence*, 16/1, 2012, pp. 53-66.

⁵ Olarewaju Odunayo Magret, Msomi Thabiso Sthembiso, "Intellectual capital and financial performance of South African development community's general insurance companies", *Heliyon*, 7/2021, e06712, pp. 1-10.

⁶ Kočović Jelena, Rakonjac Antić Tatjana, Koprivica Marija, Bradić Kristina, "Pravci razvoja tržišta osiguranja", *Tokovi osiguranja*, 3/2024, str. 536-549.

⁷ Njegomir Vladimir, "Analiza stanja i trendova sektora osiguranja u Srbiji", *Trendovi osiguranja*, 3/2011, pp. 3-15.

⁸ Soković Ivana, "Značaj osiguranja i perspektive razvoja u Srbiji", *Tokovi osiguranja*, 2/2024, str. 265-280.

⁹ Lu Wen-Min, Wang Wei-Kang, Kweh Qian Long, "Intellectual capital and performance in the Chinese life insurance industry", *Omega*, 42/2014, pp. 65-74.

¹⁰ Kweh, Qian Long, Lu Wen-Min, Wang Wei-Kang, "Dynamic efficiency: intellectual capital in the Chinese non-life insurance firms", *Journal of Knowledge Management*, 18/5, 2014, pp. 937-951.

¹¹ Lu Wen-Min, Wang Wei-Kang, Kweh Qian Long, "Intellectual capital and performance in the Chinese life insurance industry", *Omega*, 42/2014, pp. 65-74.

¹² Kweh, Qian Long, Lu Wen-Min, Wang Wei-Kang, "Dynamic efficiency: intellectual capital in the Chinese non-life insurance firms", *Journal of Knowledge Management*, 18/5, 2014, pp. 937-951.

¹³ Lu Wen-Min et al. (2014).

The literature review revealed the following research gaps. First, both practitioners and academics realize that it is necessary to do more research on intellectual capital in terms of its measurement, management, and disclosure in insurance companies, which will contribute to a better analysis of profitability¹⁴. Second, studies on the relationship between intellectual capital and the business performance of companies are numerous but limited in the field of insurance companies¹⁵. Previous studies which focus on the financial sector have mainly investigated intellectual capital in the banking industry¹⁶. Third, the researchers noted that there is a lack of research on this topic in emerging countries or countries in transition¹⁷. Emerging markets differ from developed markets by low markets, information efficiency, volatility, and overall size¹⁸, which will additionally encourage the need to analyze the contribution of intellectual capital to strengthen the profitability of insurance companies, as one of the carriers of the monetary sector. The insurance market of Serbia belongs to the group of emerging markets.

The paper contains an introduction and three other parts. The second part presents a brief overview of the definition and components of intellectual capital in insurance companies, as well as an overview of previous research on the contribution of this capital to the profitability of the insurance sector. The third part of the paper describes the sample and applied methodology and presents the results of empirical research. The fourth part of the paper includes a discussion of the obtained results concerning previously conducted research, with the limitations of the research and the direction of future research.

II Literature review

1. Intellectual capital in insurance companies

A knowledge-based economy functions through the use of knowledge and information¹⁹, which singles out intellectual capital as one of the significant drivers of

¹⁴ Asare Nicholas, Alhassan Abdul Latif, Asamoah Michael Effah, Ntow-Gyamfi Matthew, "Intellectual capital and profitability in an emerging insurance market", *Journal of Economic and Administrative Sciences*, 33/1, 2017, pp. 2-19.

¹⁵ Asare Nicholas et al. (2017) and Oppong Godfred Kesse, Pattanayak Jamini Kanta, Irfan Mohd, "Impact of intellectual capital on productivity of insurance companies in Ghana: A panel data analysis with System GMM estimation", *Journal of Intellectual Capital*, 20/6, 2019, pp. 763-783.

¹⁶ Asare Nicholas et al. (2017) and Mamun Syed Abdulla, Aktar Alima, "Intellectual capital disclosure practices of financial institutions in an emerging economy", *PSU Research Review*, 5/1, 2020, pp. 33-53.

¹⁷ Dalwai Tamanna, Mohammadi Syeeda Shafiya, "Intellectual capital and corporate governance: an evaluation of Oman's financial sector companies", *Journal of Intellectual Capital*, 21/6, 2020, pp. 1125-1152.

¹⁸ *Ibidem*

¹⁹ Alipour Mohammad (2012).

value creation in companies²⁰. Thus, the operations of knowledge-based companies increasingly depend on the use of intellectual capital²¹, in support of which some studies estimate that 50 out of 90% of the value created for the company is created by the use of this capital²². Research indicates that intellectual capital is considered a source of competitive advantage and sustainability for companies on the market²³ by becoming a key factor in product and service innovation²⁴. Accordingly, intellectual capital plays a very important role in achieving sustainable results for knowledge-based companies, which include financial institutions and insurance companies²⁵. Insurance companies must be directed toward the development and efficient use of intellectual capital, knowledge, and new ideas, which will improve the competitiveness of financial institutions²⁶. Previous, modest research notes that insurance companies have low intellectual capital efficiency compared to other financial institutions²⁷. Therefore, it can be concluded that the insurance sector has many challenges that require an innovative approach, such as an approach to intellectual capital management²⁸.

Intellectual capital can be defined as part of the intangible assets of an insurance company with the help of which the added value of new products, processes, and services is created²⁹. Researchers today equate intellectual capital with knowledge assets³⁰. In this context, author³¹ describes intellectual capital as a set of knowledge assets that are owned and/or controlled by insurance companies and that significantly enhance the mechanisms of organizational value creation for key company stakeholders.

As an asset that constitutes a significant part of the company, in the broadest sense, intellectual capital includes human capital (e.g. skills, knowledge, experience, etc.) and structural capital (e.g. company culture, systems, working environment)³². Human capital includes the knowledge, experiences, abilities, skills, creativity, and

²⁰ Dalwai Tamanna, Mohammadi Syeeda Shafiya (2020).

²¹ Mamun Syed Abdulla, Aktar Alima (2020).

²² Alipour Mohammad (2012).

²³ Dalwai Tamanna, Mohammadi Syeeda Shafiya (2020); Mamun Syed Abdulla, Aktar Alima (2020).

²⁴ Krstić Bojan, Jovanović Vujatović Milica (2022).

²⁵ Mamun Syed Abdulla, Aktar Alima (2020).

²⁶ Lu Wen-Min et al. (2014) and Alipour Mohammad (2012).

²⁷ Joshi Mahesh, Cahill Daryll, Sidhu Jasvinder, Kansal Monika, «Intellectual capital and financial performance: an evaluation of the Australian financial sector», *Journal of Intellectual Capital*, 14/2, 2013, pp. 264-285.

²⁸ Olarewaju Odunayo Magret, Msomi Thabiso Sthembiso, "Intellectual capital and financial performance of South African development community's general insurance companies", *Heliyon*, 7/2021, e06712, pp. 1-10.

²⁹ Mamun Syed Abdulla, Aktar Alima (2020).

³⁰ Asare Nicholas et al. (2017).

³¹ Alipour Mohammad (2012).

³² Carson, E., Ranzijn, R., Winefield Anthony, Marsden Helen, "Intellectual capital: Mapping employee and work group attributes", *Journal of Intellectual Capital*, 5/3, 2017, pp. 443 - 463.

innovation of employees³³. Improving the value of human capital requires employee training programs³⁴, which will further improve employee efficiency³⁵ as well as company productivity³⁶. Through the development and improvement of the value of human capital, insurance companies adapt to dynamic challenges from the environment and maintain a satisfactory level of performance³⁷. The authors³⁸ talk about the importance of human capital, indicating that the loss and departure of qualified employees pose serious threats to the survival of insurance companies. Structural capital can be defined as knowledge created by an organization that cannot be separated from the entity³⁹. This component of intellectual capital includes non-human assets such as organizational structure, routines, systems, hardware, databases, organizational culture⁴⁰, rules, procedures, and decision-making policies in the company⁴¹. As a necessary organizational infrastructure of knowledge-intensive companies, investment in the capital structure leads to the improvement of business results⁴².

2. Intellectual capital and profitability of insurance companies

Intellectual capital, together with financial capital, is considered the main factor in the profitability of a company⁴³. Profitable business implies efficient use of intellectual capital through value creation and sustainable growth⁴⁴. The efficiency of intellectual capital can be improved through additional investments in this type of capital⁴⁵, especially through the improvement of human and structural capital. In the literature, special attention is paid to intellectual capital, proper management, and investment in this type of capital to increase business profitability⁴⁶.

³³ Mäenpää Irinja, Voutilainen Raimo, "Insurances for human capital risk management in SMEs", *VINE*, 42/1, 2012, pp. 52-66. and Olarewaju Odunayo Magret, Msomi Thabiso Sthembiso (2021).

³⁴ Joshi Mahesh et al. (2013).

³⁵ Olarewaju Odunayo Magret, Msomi Thabiso Sthembiso (2021).

³⁶ Mäenpää Irinja, Voutilainen Raimo (2012).

³⁷ Jakubiv Marija, Pršić Mladen, & Ćirić Miloš, "The effects of organizational factors on work outcomes – The role of employee resilience in hospitality kitchens", *Hotel and Tourism Management*, 10/2, 2022, pp. 71–89.

³⁸ Mäenpää Irinja, Voutilainen Raimo (2012).

³⁹ Joshi Mahesh et al. (2013).

⁴⁰ *Ibidem*

⁴¹ Olarewaju Odunayo Magret, Msomi Thabiso Sthembiso (2021).

⁴² *Ibidem*

⁴³ Alipour Mohammad (2012).

⁴⁴ Dalwai Tamanna, Mohammadi Syeeda Shafiya (2020) and Alipour Mohammad (2012).

⁴⁵ Lu Wen-Min et al. (2014).

⁴⁶ Farooq Muhammad, Ahmad Naeem, "Nexus between board characteristics, firm performance and intellectual capital: an emerging market evidence", *Corporate Governance*, 23/6, 2023, pp. 1269-1297. and Firer Steven, Stainbank Lesley, "Testing the relationship between intellectual capital and a company's performance: Evidence from South Africa", *Meditari Accountancy Research*, 11/1, 2003, pp. 25-44.

Monitoring the profitability of financial institutions is important for all stakeholders: managers, clients, and depositors⁴⁷. Profitability is one of the key indicators of the stability of financial institutions⁴⁸ which measures the ability of a company to keep its profit stable from year to year⁴⁹. Authors⁵⁰ view profitability as the ultimate test of risk management effectiveness. Profitability growth contributes to the economic progress of insurance companies because profits influence investment decisions and offer greater flexibility regarding the sources of investment financing⁵¹. Easier access to finance creates conditions for large investments that improve productivity, competitiveness of companies, and employment⁵².

Investing in intellectual capital is a key factor in achieving better performance of insurance companies⁵³. Although few studies have been conducted in the insurance sector in this context, one way to improve the performance of these companies is through the strategic management of intellectual capital. The disparity in the performance of insurance companies is caused precisely by the good management of strategic (intellectual) capital⁵⁴. It should also be mentioned that research on intellectual capital in the insurance sector is limited, among other things, due to the dynamic nature of profitability⁵⁵. This situation arises because the profit in the current period can be affected by the result from the previous period. After all, a larger part of the profit is kept for further investments⁵⁶.

Previously conducted studies indicate the importance of intellectual capital in insurance companies. The authors⁵⁷ conclude that, compared to other financial institutions, the insurance sector has the lowest efficiency of using intellectual capital. Authors⁵⁸ find that non-life insurance companies have higher intellectual capital performance compared to life insurers. The influence of intellectual capital components (human, structural, and relational capital) on operating efficiency in non-life

⁴⁷ Ben Selma Mokni Rim, Rachdi Houssef, "Assessing the bank profitability in the MENA region: A comparative analysis between conventional and Islamic bank", *International Journal of Islamic and Middle Eastern Finance and Management*, 7/3, 2014 pp. 305-332.

⁴⁸ Kanapiyanova Kamshat, Faizulayev Alimshan, Ruzanov Rashic, Ejdyds Joanna, Kulumbetova Dina, Elbadria Marei, "Does social and governmental responsibility matter for financial stability and bank profitability? Evidence from commercial and Islamic banks", *Journal of Islamic Accounting and Business Research*, 14/3, 2023, 451-472.

⁴⁹ Menicucci Elisa, Paolucci Guido, "The determinants of bank profitability: empirical evidence from European banking sector", *Journal of Financial Reporting and Accounting*, 14/1, 2016 pp. 86-115

⁵⁰ Ben Selma Mokni Rim, Rachdi Houssef (2014).

⁵¹ Menicucci Elisa, Paolucci Guido (2016).

⁵² *Ibid.*

⁵³ Lu Wen-Min et al. (2014).

⁵⁴ Olarewaju Odunayo Magret, Msomi Thabiso Sthembiso (2021).

⁵⁵ Oppong Godfred Kesse et al. (2019).

⁵⁶ *Ibidem*

⁵⁷ Dalwai Tamanna, Mohammadi Syeeda Shafiya (2020).

⁵⁸ Asare Nicholas et al. (2017).

insurance companies is confirmed by the authors⁵⁹. The same results are reached by authors⁶⁰ proving that intellectual capital is significantly positively associated with firm operating efficiency but in Chinese life insurance. Authors⁶¹ prove that just structural and human capital have a significant relationship with function in insurance companies. Authors⁶² conclude that intellectual capital along with human capital and capital employed significantly affect the productivity of insurance companies.

Previous research analyzed the contribution of intellectual capital in insurance companies through the VAIC (Value added intellectual coefficient) method. Authors⁶³ demonstrate the presence of a significant and positive relationship between intellectual capital and the profitability of insurance companies in Ghana, with human capital efficiency being the main driver of intellectual capital performance. In contrast to this study, the authors⁶⁴ conclude that capital employed efficiency (CEE) is a key contributor to VAIC in insurance companies. Authors⁶⁵ conclude that insurance companies in Australia are more focused on physical capital than on human and structural capital, leading to lower VAIC. Bearing in mind the specificity of the insurance sector in Serbia⁶⁶ and the fact that the financial sector of Serbia is still dominated by the influence of physical property⁶⁷, there is a need to analyze the contribution of intellectual capital and its components to the profitability of insurance companies in Serbia.

The profitability of insurance companies will be monitored through indicators of return on assets (ROA) and return on equity (ROE)⁶⁸. ROA is used to measure the efficiency of using assets to generate profit while ROE measures a company's ability to increase invested capital to generate profit⁶⁹. The ROA indicator is suitable for use when comparing smaller financial institutions and for monitoring their financial performance, while the ROE indicator is suitable for comparison between larger financial

⁵⁹ Kweh, Qian Long et al. (2014).

⁶⁰ Lu Wen-Min et al. (2014).

⁶¹ Yeganeh Mohammad Vafaei, SHarahi Bahman Yasbolaghi, Mohammadi Esfandyar, Beigi Fatemeh Hava, "A Survey of the Relationship between Intellectual Capital and performance of the Private Insurance Companies of Iran", *Procedia - Social and Behavioral Sciences*, 114, 2014, pp. 699 – 705.

⁶² Oppong Godfred Kesse et al. (2019).

⁶³ Asare Nicholas et al. (2017).

⁶⁴ Dalwai Tamanna, Mohammadi Syeeda Shafiya (2020).

⁶⁵ Joshi Mahesh et al. (2013).

⁶⁶ Dimić Maja, Balaban Mladenka, Paunović Svetislav, "Effects of ownership transformation of insurers on insurance sector in Serbia" *Journal of Insurance Theory and Practice*, 4/2023, pp. 525-538.

⁶⁷ Bontis Nick, Janosevic Stevo, Dzenopoljac Vladimir, "Intellectual capital and corporate performance of Serbian banks", *Actual problems of economics*, 4/34, 2013, pp. 287 – 299.

⁶⁸ Mondal Amitava, Ghosh Santanu Kumar, "Intellectual capital and financial performance of Indian banks", *Journal of Intellectual Capital*, 13/4, 2012, pp. 515-530.

⁶⁹ Xu Jian, Haris Muhammad, Liu Feng, "Intellectual capital efficiency and firms' financial performance based on business life cycle", *Journal of Intellectual Capital*, 24/3, 2023, pp. 653-682.

institutions⁷⁰. Previous research confirms the influence of VAIC and its components on the ROA of insurance companies⁷¹. Also, the impact of intellectual capital on ROA has been proven in the banking sector⁷². Bearing in mind the increasing importance of intellectual capital in creating sustainable business performance and competitive advantage, it is necessary to investigate the nature of the relationship between intellectual capital and the ROA of insurance companies in Serbia. Accordingly, the following hypotheses were defined:

H₁: VAIC positively contributes to the ROA of insurance companies.

H_{1a}: Human capital efficiency coefficient positively contributes to the ROA of insurance companies.

H_{1b}: Structural capital efficiency positively contributes to the ROA of insurance companies.

H_{1c}: Capital employed efficiency positively contributes to the ROA of insurance companies.

Previous research has not analyzed in detail the impact of intellectual capital on the ROE of insurance companies. Studies confirm the impact of intellectual capital on ROE in the banking sector⁷³, so it is assumed that this type of capital will have a significant impact on the ROE of insurance companies. Some studies have only partially confirmed the impact of intellectual capital on the ROE of the banking sector⁷⁴. Author⁷⁵ concludes that employed and human capital efficiencies have a dominant influence on banks' ROE, while structural capital efficiency is less important. Considering the lack of research on the relationship between intellectual capital and ROE in insurance companies in emerging countries, the following hypotheses were defined:

H₂: VAIC positively contributes to the ROE of insurance companies.

H_{2a}: Human capital efficiency coefficient positively contributes to the ROE of insurance companies.

H_{2b}: Structural capital efficiency positively contributes to the ROE of insurance companies.

H_{2c}: Capital employed efficiency positively contributes to the ROE of insurance companies.

⁷⁰ Uslu Hakan, "The role of intellectual capital in financial development: evidence from the banking sector of Turkey", *Competitiveness Review*, 32/2, 2022, pp. 230-249.

⁷¹ Alipour Mohammad (2012).

⁷² Xu Jian et al. (2023) and Githaiga Nderitu, "Intellectual capital and bank performance: the moderating role of income diversification", *Asia-Pacific Journal of Business Administration*, 15/4, 2023, pp. 509-526.

⁷³ Buallay Amina, "Intellectual capital and performance of Islamic and conventional banking: Empirical evidence from Gulf Cooperative Council countries", *Journal of Management Development*, 38/7, 2019, pp. 518-537 and Xu Jian et al. (2023).

⁷⁴ Mollah Md. Anhar Sharif, Rouf Md. Abdur, "The impact of intellectual capital on commercial banks' performance: evidence from Bangladesh", *Journal of Money and Business*, 2/1, 2022, pp. 82-93.

⁷⁵ Uslu Hakan (2022).

III Research methodology and sample data

The research in the paper was conducted on a sample of 16 insurance companies that operated at the end of 2022 in the Republic of Serbia, while their operations were observed in the period from 2018 to 2022. According to data from the National Bank of Serbia (2023), four companies deal exclusively with life insurance, six deal exclusively with non-life insurance, and six insurance companies deal with both life and non-life insurance. According to the ownership structure, 15 companies are majority foreign-owned (Narodna Banka Srbije, 2023)⁷⁶. The calculation of profitability indicators and coefficients of intellectual capital is based on the data presented in the financial reports of insurance companies, which are available on the official website of the Serbian Business Registers Agency.

VAIC is a monetary measure that provides the advantage of providing numerical results that are comparable within departments and across industries⁷⁷. VAIC is suitable for measuring the value of intellectual capital because it provides comparative analysis among companies, which is why it varies widely across industries. Research shows that this method is often used in the banking sector⁷⁸.

The VAIC coefficient measures how much new value is created per invested monetary unit in intellectual and physical capital⁷⁹. VAIC represents the sum of the following coefficients⁸⁰:

$$\text{VAIC} = \text{HCE} + \text{SCE} + \text{CEE}$$

Wherein:

- HCE - human capital efficiency coefficient. It is calculated as a ratio of value added and the value of human capital. Value added is calculated as the sum of operating, employee costs, depreciation, and amortization, while the value of human capital is the total salaries and wages of the company⁸¹.
- SCE – structural capital efficiency. it is calculated as the ratio of the value of structural capital and value added. The value of structural capital is the difference between value added and human capital⁸².
- CEE – capital employed efficiency coefficient is calculated as a ratio of value added and book value of net assets of the company⁸³.

⁷⁶ Godišnji izveštaj o poslovanju i rezultatima rada. Narodna banka Srbije, 2023, Beograd.

⁷⁷ Dalwai Tamanna, Mohammadi Syeeda Shafiya (2020).

⁷⁸ Joshi Mahesh et al. (2013).

⁷⁹ Pulić Ante, "Intellectual capital –does it create or destroy value?" *Measuring Business Excellence*, 8/1, 2004, 62–68.

⁸⁰ *Ibid.*

⁸¹ *Ibid.*

⁸² *Ibid.*

⁸³ *Ibid.*

The profitability of insurance companies is measured by the return on assets (ROA) and return on equity (ROE). For paper purposes, ROA is calculated as the ratio of net profit and value of assets, while ROE is the ratio of net profit and value of equity.

To examine the impact of the VAIC model and its components on the profitability of insurance companies in the Republic of Serbia, two general regression models were formed:

$$\text{Model 1: } \text{PROF}_{it} = \beta_0 + \beta_1 \text{VAIC}_{it}$$

$$\text{Model 2: } \text{PROF}_{it} = \beta_0 + \beta_1 \text{HCE}_{it} + \beta_2 \text{SCE}_{it} + \beta_3 \text{CEE}_{it}$$

where PROF represents ROA and ROE.

In addition to regression analysis, descriptive and correlational analysis was also applied in the paper. Statistical package for social sciences was used for statistical data processing IBM SPSS Statistics (version 23) and EViews (version 12).

IV Research results and discussions

Descriptive statistics of the research variables are shown in Table 1. Of the three components of the VAIC model, HCE has the highest mean value (Mean = 4.163), while the lowest mean value is identified with SCE (Mean = 0.504). A negative value of SCE was identified at two insurance companies (at one insurer in 2018 and at the other in 2019). The mean value of ROE of insurance companies is 0.248 and is higher than the value of ROA (Mean = 0.029).

Table 1. Descriptive statistics

	Mean	Median	Std. Deviation	Minimum	Maximum
HCE	4.163	2.785	3.009	0.111	12.000
SCE	0.504	0.641	1.033	-7.974	0.917
CEE	0.461	0.397	0.296	0.010	1.420
VAIC	5.128	3.809	3.736	-7.853	13.671
ROA	0.029	0.025	0.025	-0.045	0.095
ROE	0.248	0.174	0.223	-0.074	0.914

Source: Authors

The results of the Pearson correlation analysis are shown in Table 2. Looking at the correlation between the components of the VAIC model, there is a strong, positive, and statistically significant correlation between HCE and CEE ($\rho=0.768$, $p=0.000$). The correlation between the other VAIC components is moderate and statistically significant. Profitability indicators establish a generally strong and

statistically significant relationship with VAIC and its components, with the strongest correlation identified between ROE and CEE ($\rho=0.951$, $p=0.000$).

Table 2. Correlation analysis

	HCE	SCE	CEE	VAIC	ROA	ROE
HCE	1					
SCE	0.348**	1				
CEE	0.768**	0.351**	1			
VAIC	0.963**	0.584**	0.795**	1		
ROA	0.591**	0.479**	0.567**	0.654**	1	
ROE	0.856**	0.347**	0.951**	0.861**	0.675**	1

Source: Authors

The results of the Hausman test are shown in Table 3, where it is concluded that the Random effect model is more adequate in 3 out of 4 cases compared to the Fixed effect model. In other words, the Fixed effect model is adequate for examining the influence of the VAIC value on the ROA value.

Table 3. Hausman test

Depend	Model 1 (ROA)	Model 1 (ROE)	Model 2 (ROA)	Model 2 (ROE)
Chi-sq. statistic	60.596	0.873	5.013	1.254
Chi-sq. d.f.	1	1	3	3
p-value	0.0138	0.3501	0.1708	0.740
Effects	Fixed	Random	Random	Random

Source: Authors

Based on the data in Table 4, it can be concluded that VAIC contributes positively to the observed profitability indicators (ROA and ROE) of insurance companies in Serbia during the observed period. This means that hypotheses **H₁** and **H₂** are accepted.

Table 4. Regression analysis: VAIC and profitability of insurance companies

	Model 1 (ROA)	Model 1 (ROE)	Model 2 (ROA)	Model 2 (ROE)
C	-0.005 (-1.719)*	0.004 (0.003)	-0.004 (-0.828)	-0.104 (-6.749)
VAIC	0.007 (12.428)***	0.0482 (13.175)***		
HCE			0.004 (3.512)***	0.023 (5.445)***
SCE			0.007 (4.662)***	-0.004 (-0.737)
CEE			0.026 (2.105)**	0.562 (13.692)***
Adj. R ²	0.814	0.686	0.654	0.923
F-value	(22.613)***	(173.867)***	(50.814)***	(318.550)***
<p>Note: * - statistical significance at the 0.1 level; ** - statistical significance at the 0.05 level; *** - statistical significance at the 0.01 level.</p>				

Source: Authors

Observing the components of VAIC, the contribution of HCE and CEE to profitability indicators of insurance companies was identified, whereby **H_{1a}, H_{1c}, H_{2a}, and H_{2c} were accepted**. Only a positive contribution of SCE to ROA was identified, while the impact on the ROE of insurance companies was absent, so hypothesis **H_{1b} was accepted** while hypothesis **H_{2b} was rejected**. Such results are expected considering the low mean SCE.

V Discussion of the results, implications and limitations of the research

Intellectual capital is increasingly becoming a creator of value and a company's competitive advantage, especially in knowledge industries such as insurance⁸⁴. This is supported by the results of the study indicating that VAIC contributes to the profitability indicators of insurance companies. The same results were reached by the authors⁸⁵. These results are in line with the conclusions of the authors⁸⁶ that the

⁸⁴ Nimtrakoon Sirinuch, "The relationship between intellectual capital, firms' market value and financial performance: Empirical evidence from the ASEAN", *Journal of Intellectual Capital*, 16/3, 2015, pp. 587-618.

⁸⁵ Alipour Mohammad (2012) and Asare Nicholas et al. (2017).

⁸⁶ Maji Santi Gopal, Saha Rupjyoti, "Does intellectual capital influence banks' efficiency? Evidence from India using panel data tobit model", *Managerial Finance*, 50/4, 2024, pp. 697-717.

orientation of financial institutions towards intellectual resources leads to more efficient functioning, thus ensuring profitability in the long term. Despite not being fully reflected in financial statements, the value of intellectual capital remains a major driver of insurance company profitability⁸⁷.

Research on the contribution of VAIC components to the profitability of insurance companies produced the following results. First, the impact of SCE is proven only in the case of ROA of insurance companies. A weaker influence of SCE on profitability was also identified in the study authors⁸⁸. The lack of impact on ROE is a consequence of insufficient investment and development of the organizational infrastructure. Second, the results of the study prove the impact of HCE on the profitability of insurance companies. This influence was also proved by the authors⁸⁹. Insurance company employees create investment plans and policies to ensure good returns on premiums generated⁹⁰. These and other important tasks make human capital an important factor that insurance companies use to gain a competitive advantage⁹¹. In support of that, authors⁹² state that financial institutions should support the development of human capital since they are responsible for the efficient use of all other resources. Third, the results show that physical capital has a dominant influence on the profitability of insurance companies. Such results are expected since financial companies are still more committed to physical than to intangible assets⁹³. Authors⁹⁴ explain why managers focus on physical assets - investing in intellectual assets is more risky, the effects of investing in intellectual assets cannot be quantified and the costs of maintaining intellectual assets are high.

Practical implications. The results of the research indicate that in the coming period, insurance companies should focus more on investing in intellectual capital. The era of knowledge requires, in addition to investments, efficient management of intellectual capital, so managers must provide working conditions that will provide employees with additional knowledge for managing intellectual capital. In addition, the management of insurance companies is advised to invest in and improve structural capital, which represents support for the development and increase of the value of human capital.

Research limitations and future research directions. The limitation of the research is related to the application of VAIC methods. Authors⁹⁵ state that VAIC does not

⁸⁷ Asare Nicholas et al. (2017).

⁸⁸ Joshi Mahesh et al. (2013).

⁸⁹ Asare Nicholas et al. (2017).

⁹⁰ *Ibid.*

⁹¹ *Ibid.*

⁹² Maji Santi Gopal, Saha Rupjyoti (2024).

⁹³ Bontis Nick et al. (2015).

⁹⁴ Firer Steven, Stainbank Lesley (2003).

⁹⁵ Dalwai Tamanna, Mohammadi Syeeda Shafiya (2020).

accurately calculate the value of intellectual capital because it cannot be expressed through the efficiency of investment in labor and capital of the company. Because of these shortcomings, researchers have tried to create other, expanded versions of the VAIC method, such as MVAIC, which includes R&D and copyright investment in the calculation of the value of intellectual capital⁹⁶. The original aim of the paper was the application of MVAIC methods. However, the financial statements of insurance companies do not show expenditures for research and development, advertising, and copyright. Future research could be based on expanding the observed profitability performance of insurance companies. Also, in the future, researchers could conduct a comparative analysis of the contribution of intellectual capital and its components to insurance companies and banks in Serbia.

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⁹⁶ *Ibid.*

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