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DOES THE EFFICIENT USE OF VISIBLE INTELLECTUAL CAPITAL DETERMINE THE PROFITABILITY IN THE AUTOMOTIVE INDUSTRY?

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Abstract: Intellectual capital (IC) is one of the core determinants of the value of companies, and value creation for stakeholders as well as improvement of the competitiveness of the companies. Effective management of all visible and invisible elements of the total IC is extremely important for business success, since the effective providing, creating, developing and efficient use of intellectual resources affects various business performances, such as income, market share, net profit, and profitability of the company quantified by various performance measures of Return on assets (ROA) and Return on equity (ROE). One part of the total IC is disclosed and visible in the assets side of the balance sheet (Intellectual assets and Goodwill - Iag), while the other, is undisclosed and invisible (Human capital - Hc and Structural and relational capital - SRc). Efficiency in the usage of all these elements of IC has an impact on profitability. The purpose of this research (based on 12 leading companies in the automotive industry from 2010 to 2019) is to examine the interdependence, as well as the influence, of the Efficiency in the use of Intangible assets and goodwill (Eiag) on various rations of ROA and ROE using the EIC (the Efficiency of Intellectual Capital) model for calculation of the Eiag indicator. Although there are numerous studies that use the VAIC methodology to research the interdependence and impact of the efficiency of certain elements of IC on business performance, as well as, in particular, on profitability, the originality of this paper is based on an investigation of the interdependence and influence of Eiag on profitability (ROA and ROE), which is not the case with the studies of other researchers so far, because Pulić's VAIC methodology does not separate the visible IC component i.e. Iag. The outcomes of this study confirm a positive relationship between the efficiency in the use of intangible assets and goodwill (Eiag) and profitability (ROA and ROE), as well as the growing impact of Eiag on profitability indicators (ROA and ROE). The findings imply the extreme importance of effective and efficient management of all elements of intellectual assets that are visible on the assets side of the balance sheet, taking into account the evident impact on profitability.

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Introduction

In former times, inquiries into the creation of market value of enterprises were addressed through investment in material assets (Galbreath, 2002). Today, the situation has changed. To create the company value in the market, investing the accumulated profit in quantitative enlargement and qualitative development of internal intellectual resources is crucial. The overall value of all non-material, intellectual resources of a firm is in its IC. These immaterial resources are utilized

to enhance the worth of the company and provide future benefits and significantly contribute to the business success (Yallweb & Buscemi, 2014). The greater IC efficiency of a business in the current period come up with to better development of intellectual resources in the future (Jovanović, Petrović, & Janjić, 2021, p. 18). as well as investment in physical or financial assets. It is a re

For each shareholder, it is relevant that each investment is profitable, and provides a return on invested capital or employed assets. Profitability is the main economic principle, economic goal, and business performance indicator (Krstić, 2022). Investment in intellectual resources should be profitable as on why IC managers should define and implement smart IC development strategies, as well as managerial tools for setting, measuring and controlling IC performance targets, IC performance reporting, and making plans, programmes, initiatives and actions for the development of visible and invisible intellectual resources.

IC is a strategic asset that is mostly undisclosed (invisible) in the enterprise's financial statements, although it contributes the most to value creation (Ordonez de Pablos, 2004). Some authors also use terms such as intangible assets or intangible capital for IC. This capital, Marrocu, Paci and Pontis (2012) treat as an element of knowledge resources and a key factor of business performance. These researchers (Marrocu, Paci, & Pontis, 2012, p. 377) point out the relevance of policies and strategies for the stimulation and enlargement of the accumulation of intangible capital for sustainable competitive advantages. According to Tsai, Lu and Yen (2012), intangible assets include employee competencies and creativity, organization structure, culture and climate, employment centripetal force, potential for innovation creating, R&D capital, customer base size, recognizable brand, corporate image, reputation, and intellectual property etc. Intangible or intellectual assets build the dynamic capability of a company. Intangible or intellectual assets are created on the basis of organizational and core competencies which are developed in the previous period, but a new portfolio of IC elements is a base for future improvement of existing and new organizational competencies, as well as core competencies which provide a substantial competitive power on the market.

1. Theoretical background

1.1. The concept of the total IC of the enterprise – visible and invisible

There is no generally accepted concept in the theory of IC, but different approaches are differentiated, which respect the use of different terms for essentially similar IC components of the enterprise. The principles of economic efficiency of the company, in essence, require the achievement of high efficiency in the use of total IC. Total IC consists of (1) *IC that is disclosed in the balance sheet as a position -*

Intangible assets and Goodwill (Iag) and (2) *IC that is undisclosed in the balance sheet (ΔIC)* (Krstić & Bonić, 2016):

$$IC = Iag + \Delta IC \quad (1)$$

where *Iag* is Intangible assets and Goodwill, and *ΔIC* consists of the value of Human capital (Hc) and the value of Structural and relational capital (SRc), according to the following (Krstić & Bonić, 2016):

$$IC = Iag + Hc + SRc \quad (2)$$

Intangible assets and goodwill (Iag) are segments of a company's IC disclosed (visible) in the balance sheet in accordance with IAS 38 (IAS 38 - Intangible Assets). According to this accounting standard IAS 38, intangible assets represent non-monetary assets that can be identified, without physical characteristics, such as patents, licenses, trademarks and similar property rights. IAS 38 determines that internally generated goodwill cannot be disclosed in the assets of the balance sheet because the value of these assets cannot be identified, controlled and reliably measured - according to the purchase value (Krstić, 2014, p. 73-75). IAS 38 defines the conditions for recognition of an intangible asset in the balance sheet - only goodwill from business combinations can be displayed. This is the value of future benefits of an asset (which arise from a business combination) that are not individually identified and separately recognised. "Goodwill which arises from acquisition is calculated as the difference between the fair value of the price paid for the subsidiary and the fair value of the net assets acquired" (Weetman, 2003).

The position "Intangible assets" at the assets side on the balance sheet represents the investments in certain non-monetary assets, which are used for the production of goods and services, for rent or for administrative purposes. This includes:

- Investments in development, whose effects are expected in a period longer than one year. According to *IAS 38 – Intangible assets*, development is the implementation of research results to a "plan or design for the production of new or improved materials, devices, products, processes, systems or services before the beginning of commercial production or use".
- Concessions, patents, licenses, trademarks and service marks, and investments in intangible rights recognized in accordance with the accounting policy are reported. Intangible rights include information, trade secrets, patents, copyrights, trademarks, trade names and other intangible assets that are necessary for everyday business operations of a company.
- Software and other rights, software that was purchased separately from the computer based on a license agreement, based on which it can be used for a

period longer than one year (including the right to unlimited use) and other rights in accordance with the accounting policy;

- Goodwill which arises from a business combination;
- Investments in other intangible assets that are disclosed in accordance with the accounting policy;
- Intangible assets leased, intangible assets with the right to use for more than one year;
- Intangible assets in preparation, all forms of intangible assets recognized in accordance with the accounting policy from the date of investment to the day of their activation;
- Advances payments for intangible assets, and advances given for the acquisition of all forms of intangible assets.

For the recognition of these items, it is necessary to meet the conditions according to the appropriate accounting principles and standards.

Unreported, undisclosed (invisible) IC (ΔIC), as a complex segment of IC, appears due to the strict criteria imposed by the IAS 38 standard, but also due to difficulties in determining the precise value of certain segments of intellectual assets, bearing in mind their intangible nature, especially when it comes to the valuable relationships that an enterprise builds with external stakeholders, the reputation and identity of the company, the organizational structure and culture, management and other elements of IC that are difficult to measure. Undisclosed IC consists of the human capital (*Hc*) and Structural and relational capital (*SRc*) of an enterprise. *Undisclosed IC* is calculated as a summation of Human (*Hc*), and Structural and relational capital (*SRc*) (Krstić & Bonić, 2016):

$$\Delta IC = Hc + SRc \quad (3)$$

Edvinsson and Malone (1997) point out that IC is based on human capital, structural capital and capital in relationships with customers (clients). Ross and Ross (1997) adopt the IC concept based on human capital, organizational (or structural) capital and customer (or relational) capital as capital contained in relationships with customers and other key stakeholders. Bontis (1998, p. 66) suggests that IC consists of human capital, structural capital and customer (or relational) capital.

Human capital (*Hc*) includes the quality of the workforce, theoretical and practical knowledge, competencies, skills and capabilities of employees, loyalty, commitment, and work ethic. Bearing in mind that it is capital based on people, this segment cannot be owned by the enterprise - by leaving the enterprise, it runs out of this valuable asset.

Structural capital (Sc) represents the infrastructure that enables the efficient use and functioning of human capital and is owned by the enterprise. Within structural capital, organizational capital, process capital and innovation capital are differentiated. Organizational capital refers to the systems and structures that support the organization. Process capital includes the procedures and policies that enable efficient business operations. Finally, innovation capital includes innovation capital, R&D capital and intellectual property (legally protected intellectual assets of an enterprise) and other intangible assets that are not legally protected.

Relational capital (Rc) is based on relationships with stakeholders - the enterprise's relationships with internal (owners, employees) and external stakeholders (shareholders, suppliers, strategic partners, local community).

In the IC literature, the value of one part of the IC, non-disclosed in the balance sheet (marked as ΔIC), is calculated by (Krstić & Bonić, 2016, p. 725, 726):

$$\Delta IC = Mc - E \quad (4)$$

and

$$E = As - L - Nci \quad (5)$$

where: Mc – market capitalization, E – net assets or equity attributable to parent enterprise's shareholders, As – the book value of the disclosed assets, L – total current and non-current liabilities, Nci – non-controlling (minority) interests or outside stockholders' interests in subsidiaries (Krstić & Bonić, 2016, p. 725, 726).

1.2. Visible IC and profitability

In the era of intangible assets, Ocak & Fındık (2019) point out that managers should bear in mind that more efficient investment in those resources will improve business performance or business success. Businesses with a higher stock of intangible assets or higher levels of various IC performance are expected to achieve higher profitability rates.

A study which focuses on companies in the manufacturing sector in Italia (Arrighetti, Landini, & Lasagni, 2014) reports that there is a great variousness in their intangible assets investments. They also conclude that the inclination to undertake investments into intangible assets increases with the human resources, size of enterprise, and intangible asset base which is accumulated in previous period.

The valuation of intangible assets in smart, knowledge-intensive companies becomes a core topic and, as a result, it becomes important to understand the factors and determinants of the value of intangible assets. Therefore, the study conducted by Tsai and Yen (2010) reveals that profitability is an important factor that impacts the future growth and development of intellectual resources in Taiwan.

The adequate valuation of intangible assets is grounded in stocks disclosed on the assets side of balance sheets (Marrocu, Paci, & Pontis, 2012). On the contrary, some authors implement aggregate estimation and derive the value of intellectual assets from firm expenditures on "intangibles" such as R&D expenditure, training expenditure and innovation (Corrado, Hulten, & Sichel, 2005), as well as advertising costs. In financial theory and practice, accounting-based valuation methods of intangible assets are very popular (Petković, Krstić, Rađenović, 2020).

Zainudin, Ahmad Mahdzan and Leong (2018) explore factors that influence the *ROA* of selected insurance firms in eight countries from 2008 to 2014. This research reveals that firms' size, capital volume and risk are significantly related to the *ROA* of Asian life insurance firms, and suggests that these companies and their management should focus on intangible resources (goodwill, brand equity, reputation).

Businesses with a high proportion of intangible assets in total assets should manage future investments in visible IC. Zhang (2014), based on a sample of 17 firms (2014-2016) in the telecommunication business, finds out that the abovementioned share has a positive and significant impact on *ROA*.

The affirmative impact of intangible assets on various ratios of financial performance is verified in the literature. Based on the sample of 100 companies from 2017 to 2019, Alarussi & Gao (2021) determine that intangible assets have a positive and significant relationship with ROA. In addition, they provide the research outcomes about the determinants connected to profitability. Their study helps constituents to make adequate choices about intangible assets investment for their development.

Based on the sample of 3,080 subsidiaries of 641 companies in Japan, Delios and Beamish (2001) examine the impact of intangible assets on profitability of foreign subsidiary. They state that "survival and profitability have different antecedents. Host country experience has a direct effect on survival, but a contingent relationship with profitability" (Delios & Beamish, 2001).

2. Material and Methods

Research aim and conceptual framework

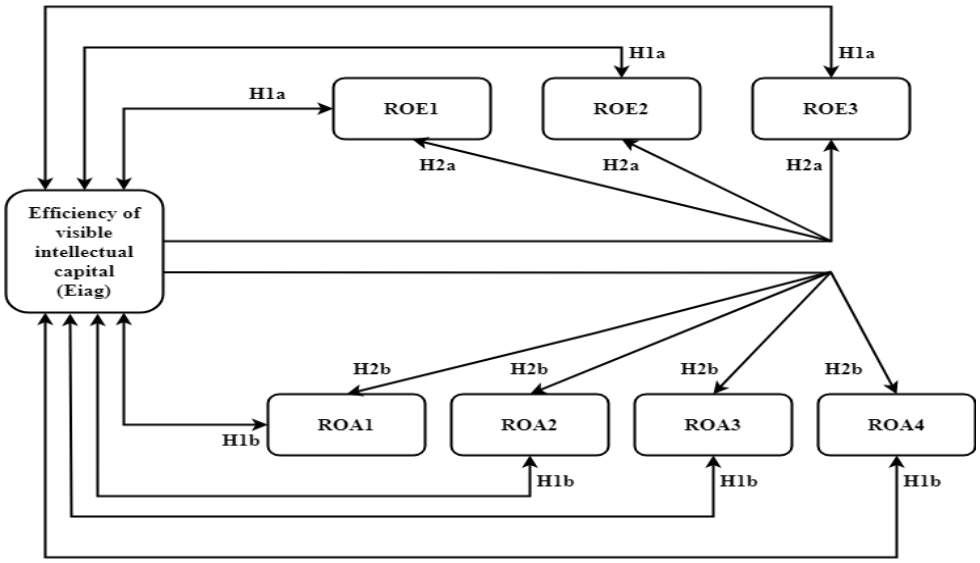
The major goal of this research is to examine:

- The interdependence of *Eiag* and different indicators for measuring *ROE* (ROE1, ROE2, ROE3), as well as different indicators for measuring *ROA* (ROA1, ROA2, ROA3, ROA4):

- The impact of *Eiag* on various indicators for measuring *ROE* (ROE1, ROE2, ROE3), as well as on various indicators for measuring *ROA* (ROA1, ROA2, ROA3, ROA4).

In order to realize the defined goal of this research, a conceptual research framework is designed, which is shown in Figure 1.

Figure 1. The conceptual framework of research



Source: Authors

Hypothesis

In order to realize the defined goal of the research, the following hypotheses will be tested:

H1: There is a positive relationship between the efficiency of visible IC or Efficiency in the use of intangible assets and goodwill (*Eiag*) and the profitability of the company measured by different *ROE* and *ROA* indicators.

H1a: There is a positive relationship between the efficiency of visible IC (Eiag) and the rate of return on equity (ROE1, ROE2, ROE3).

H1b: There is a positive relationship between the efficiency of visible IC (Eiag) and the rate of return on total assets (ROA1, ROA2, ROA3, ROA4).

H2: There is a positive influence of the efficiency of visible IC or Efficiency in the use of intangible assets and goodwill (Eiag) on the profitability of the company measured by different ROE and ROA indicators.

H2a: Growth in the efficiency of visible IC (Eiag) positively impacts return on equity (ROE1, ROE2, ROE3).

H2b: Growth in the efficiency of visible IC (Eiag) positively impacts return on assets (ROA1, ROA2, ROA3, ROA4).

In order to investigate the impact of the efficiency of the visible, displayed IC in the assets of the balance sheet on the profitability of companies in the global automotive industry, the solution provided by the EIC (the Efficiency of Intellectual Capital) model of the efficiency of IC was used to measure the efficiency indicator (*Eiag*) (Krstić, 2014; Krstić & Bonić, 2016). Key elements (*Iag, Hc, SRc*) and efficiency indicators (*Eiag, Ehc* and *Esrc*) of all segments of total IC (*Iag, Hc* and *SRc*), as well as the indicator of Efficiency in the use of total intellectual capital (*Eic*) are presented in Table 1.

Table 1. Elements and key indicators in the EIC methodology

Element/Indicator	*Formulas*
ICVA	$ICVA = EBIT + D_{fa} + Am_{ia} + Iml + Pe$ (6), *or* $ICVA = EBITDA + Pe$ (7)
Iag *Hc* *SRc*	*Iag* is visible in a balance sheet $Hc = Pe + Ib$ (8) $SRc = IC – (Iag + Hc)$ (9)
Eiag *Ehc* *Esrc*	$Eiag = ICVA : Iag$ (10) $Ehc = ICVA : Hc$ (11) $Esrc = ICVA : SRc$ (12)
Eic	$Eic = ICVA : IC$ (13)

Iag – Intangible assets and Goodwill
Hc – Human capital
SRc – Structural and relational capital
EBIT – Earnings before interest and tax
D_{fa} – Depreciation of fixed or non-current assets
Am_{ia} – Amortization of intangible assets with identifiable useful life (copyrights, patents)
Iml – Impairment loss of intangible assets with indefinite useful lives (Goodwill)
Pe – Personal expenses and other investments in human resources
Ib – Incentives and bonuses for managers and other employees
EBITDA – Earnings before interest and tax, depreciation and amortization
ICVA – Intellectual capital value added
Eiag – Efficiency in the use of intangible assets and goodwill
Ehc – Efficiency in the use of human capital
Esrc – Efficiency in the use of structural and relational capital
Eic – Efficiency in the use of total intellectual capital

Source: Krstić & Bonić, 2016, p. 733-735; Krstić, Bonić, Rađenović, Jovanović Vujatović & Ognjanović, 2023)

Although this model can be used to measure the efficiency of all elements of the company's IC (*Iag, Hc, SRc*) using the formulas in Table 1, *Eiag*, *Ehc* and *Esrc* are calculated, as well as the efficiency in the use of the total intellectual capital (*Eic*), in this research, the focus is on measuring the efficiency in the use of only one component of total IC, namely *Iag*. Iag as the component of total IC, which is disclosed at the assets side of the balance sheet under the accounting position – Non-current assets as the sum of Intangible assets and Goodwill, which is marked as *Iag*. Disclosing the accounting position Iag in the assets side on balance sheet is regulated according to IFRS, UK and Ireland GAAP and US GAAP in Table 2.

Table 2. The regulations for evaluation of IC which is disclosed in the balance sheet of publicly listed companies

IFRS	*UK and Ireland GAAP*	*US GAAP*
• IAS 38 Intangible Assets • IFRS 3 Business Combination • IAS 36 Impairment of Assets	• FRS 102 The Financial Reporting Standard • applicable in the UK and the Republic of Ireland • Section 18 Intangible Assets other than Goodwill • Section 19 Business Combinations and Goodwill • Section 27 Impairment of Assets • Reduced disclosures for subsidiaries and ultimate parents (Paragraphs 1.8 to 1.13 of FRS 102)	• FAS 141 – Business combinations • FAS 142 – Goodwill and Other Intangible Assets • Accounting standard codification (ASC) – Intangibles—Goodwill and Other (Topic 350): 350-20 Goodwill 350-30 General intangibles other than goodwill 350-40 Internal-use software 350-50 Website development costs • ASC 340 Other Assets and Deferred Cost – Capitalized Advertising Cost • ASC 985-20 Software – Cost of Software to be Sold, Leased or Marketed

Source: IAS 36, IAS 38, IFRS 3, UK GAAP, FRS 102, FRS 105, US GAAP

The reason why the focus of this research is only on the *Iag* component, that is, on the efficiency of the use of *Ia*g (through the formula Efficiency in the use of intangible assets and goodwill – *Eiag*) is that there are certain limitations in the information base (for a sample of companies from the automotive industry) that is necessary for the calculation of other IC efficiency indicators (such as *Ehc* and *Esrc*) (see formulas in Table 1).

Namely, the specifics of the branch of the automotive industry itself (huge production facilities installed in different countries, expensive robotic facilities, as

well as the entire production process) imply a large value of material assets, i.e., a large book value of these companies. Most often, the book value of these companies in the balance sheet exceeds the market value many times over. Therefore, in this research, it was not possible to express and analyse the Efficiency in the use of structural and relational capital (*Esrc*), as parts of the invisible IC of the company that result from a higher market value compared to the book value of the company. Besides, it is necessary to point out that many elements of structural and relational resources (SRc) are not possible to quantify and express in terms of money, such as, for example, corporate identity, image, reputation or relation with the local community. Also, this study does not analyse the Efficiency in the use of human capital (*Ehc*), due to the limitation of the information base in the financial reports and annual reports of companies from the automotive industry sample, for example for *Pe* or *Ib* (see Table 1). Therefore, it was not possible to precisely determine all elements for calculating the value of human capital (*Hc*), and then also the efficiency in the use of human capital (*Ehc*) in all publicly listed companies in the sample.

Sample

In order to test the defined hypotheses, secondary data collected from financial statements (income statement, notes to financial statements, etc.) and the annual reports of the analysed publicly listed companies were used. Initially, the sample includes 15 companies with the highest sales volume in 2019 based on the website www.focus2move.com, where only companies that are on this list for all 10 analysed years (2010 to 2019) were taken into account. For this reason, the sample was reduced to a total of 12 leading companies, which in the ten-year analysed period were ranked as the first 15 leading companies based on sales volume at the global level. These are the following companies: *VW Group, Toyota Motor Company, GM, Ford Motor Company, BMW Group, Honda Motor, PSA Group, Renault-Nissan-Mitsubishi Alliance, Daimler Group, FCA, Hyundai Motor Group, Suzuki Motor Corporation*. The data after 2019 is not included in the analysis because of the effects of the crisis period due to Covid-19 and the worsening performance of the publicly listed companies (market capitalisation, Intangible assets and Goodwill, Assets, EBIT, EBITDA, Net income, ROA, and ROE).

Variables

In the empirical segment of the research, the following variables are differentiated:

1) *Eiag* is an independent variable, and it represents the efficiency of IC, which is shown in the assets of the balance sheet (Intangible assets and goodwill), i.e. Efficiency in the use of intangible assets and goodwill. This efficiency indicator (see Table 1) is calculated according to the formula 10 (Krstić, 2014; Krstić & Bonić, 2016) as ratio ICVA to Iag.

2) ROA is the dependent variable. ROA is a performance measure for quantifying the efficiency of usage of the employed assets (Krstić, 2022), and for the purposes of this research, the indicators in Table 3 are used.

Table 3. ROA indicators

ROA	*Formulas*
ROA1	ROA1 = EBIT : As (14)
ROA2	ROA2 = Net income : As (15)
ROA3	ROA3 = Net income attributable to shareholders of parent company : As (16)
ROA4	ROA4 = EBITDA : As (17)

Source: Krstić, 2022.

3) ROE is also a dependent variable. ROE is the performance indicator which is measuring the efficiency of the usage of employed net assets or equity (Krstić, 2022) and for the purposes of this research, the indicators in Table 4 are used.

Table 4. ROE indicators

ROE	*Formulas*
ROE1	ROE1 = Net income : E (18)
ROE2	ROE2 = Net income attributable to shareholders of parent company : E (19)
ROE3	ROE3 = EBITDA : E (20)

Source: Krstić, 2022.

Defining statistical data processing methods

For the purpose of data analysis in the empirical research, regression and correlation analysis methods were used, with the aim of examining the influence of the efficiency of visible IC on the company's profitability.

In order to measure the degree of agreement, strength and direction between the efficiency of visible IC (intangible assets and goodwill) and the mentioned profitability performance of the company, a correlation analysis was conducted. Correlation analysis is a measure of linear correlation and should show whether there is interdependence between variables. The values of the coefficients can be from -1 to +1, where the value of the coefficients determines the strength of the relation (Bhattacherjee, 2012, p. 123). The strength of the relation can be small if the correlation coefficient has a value from 0.10 to 0.29, medium from 0.30 to 0.49 and large from 0.5 to 1 (Cohen, 1988). Correlation analysis will be conducted using Pearson's and Spearman's correlation coefficients (Pallant, 2009, p. 129-135), depending on whether the data is normally distributed. If the data distribution is normal, Pearson's correlation coefficient will be applied. Otherwise, Spearman's correlation coefficient will be applied.

In order to test the influence of the efficiency of visible IC (intangible assets and goodwill) on profitability performance, an adequate regression model was applied. This model determines the relation of dependence between the observed dependent and independent variables. When conducting the regression analysis, it is necessary to first determine the regression model, and then evaluate the regression coefficient. The choice of an adequate regression model depends on the appropriate limitations of the model parameters, and accordingly, several types are distinguished (Jovičić & Dragutinović Mitrović, 2011, pp. 129-135): 1) panel model with constant regression parameters (Pooled), 2) model of fixed effects (FEM) and 3) random (stochastic) effects model (REM).

3. Research results and discussions

In order to determine the appropriate correlation coefficient that needs to be applied, the conditions of normality of the data distribution were checked based on the Shapiro-Wilk and Shapiro-Francia tests (Table 5). The results of the applied tests indicate that the data are not normally distributed, i.e., $p < 0.05$. This means that Spearman's correlation coefficient should be applied.

Table 5. Results of normality tests

Variable	*Shapiro-Wilk*		*Shapiro-Francia*	
	W	*p-value*	*W'*	*p-value*
Eiag	0.33841	0.00000	0.32938	0.00001
ROE1	0.87978	0.00000	0.87091	0.00001
ROE2	0.73273	0.00000	0.71971	0.00001
ROE3	0.73158	0.00000	0.71495	0.00001
ROA1	0.73901	0.00000	0.72588	0.00001
ROA2	0.87496	0.00000	0.87224	0.00001
ROA3	0.84267	0.00000	0.84906	0.00001
ROA4	0.56574	0.00000	0.54029	0.00001

Source: Authors

The results of the correlation analysis are shown in Table 6. Using Spearman's correlation coefficient, it was determined that there is a statistically significant positive weak relationship between the efficiency of visible IC (Eiag) and the rate of return on equity 1 (ROE1). There is no statistically significant relationship between the efficiency of visible IC (Eiag) and the rate of return on equity 2 (ROE2). A statistically significant positive medium relationship exists between the efficiency of visible IC (Eiag) and the rate of return on equity 3 (ROE3). Based on the presented results, it can be noted that *hypothesis 1a is partially confirmed*.

When it comes to the interdependence between the efficiency of visible IC (Eiag) and the rate of return on total assets 1 (ROA1), a statistically significant medium positive relationship is present. Then, a statistically significant weak positive relationship is present between the efficiency of visible IC (Eiag), on the one hand, and the rate of return on total assets 2 and 3 (ROA2, ROA3), on the other hand. A statistically significant relationship is absent between the efficiency of visible IC (Eiag) and the rate of return on total assets 4 (ROA4). It can be noted that *hypothesis 1b is partially confirmed*.

Table 6. Results of correlation analysis

Spearman	*ROE1*	*ROE2*	*ROE3*	
Eiag	0.2775 (0.0052)	0.0064 (0.9500)	0.4621 (0.0000)	
	ROA1	*ROA2*	*ROA3*	*ROA4*
Eiag	0.4707 (0.0000)	0.2841 (0.0042)	0.2336 (0.0193)	0.1210 (0.2303)

Source: Authors

Table 7. Results of tests for the selection of an adequate model

Dependent variable	Model	*F*-test	*Breusch-Pagan LM*	*Hausman*
		H_0: Pooled. H_1: FEM	*H_0: Pooled. H_1: REM*	*H_0: REM. H_1: FEM*
ROE1	Model 1	1.66 (0.1117)	1.05 (0.1530)	
ROE2	Model 2	2.56 (0.0115)	5.69 (0.0085)	0.47 (0.4943)
ROE3	Model 3	1.81 (0.0773)	1.42 (0.1164)	
ROA1	Model 4	1.82 (0.0760)	1.41 (0.1174)	
ROA2	Model 5	1.80 (0.0795)	1.61 (0.1024)	
ROA3	Model 6	1.94 (0.0568)	2.14 (0.0718)	
ROA4	Model 7	0.36 (0.9511)	0.00 (1.0000)	

Source: Authors

After the correlation analysis, the regression analysis was applied. Table 7 shows the results of tests for the selection of an adequate regression model. The independent variable in all models is the efficiency of visible IC (Eiag), while the

dependent variable in Model 1 is the rate of return on equity 1 (ROE1); in Model 2 rate of return on equity 2 (ROE2); in Model 3 rate of return on equity 3 (ROE3); in Model 4 rate of return on total assets 1 (ROA1); in Model 5 rate of return on total assets 2 (ROA2); in Model 6 rate of return on total assets 3 (ROA3); in Model 7 rate of return on total assets 4 (ROA4). Based on the test results shown in Table 7, the panel model with constant regression parameters (Pooled) is adequate for all models except Model 2 for which the REM is adequate.

The results of the regression analysis are shown in Table 8 and Table 9. First, the analysis of the influence of the visible IC efficiency indicator (Eiag) on the rate of return on equity 1-3 (ROE1, ROE2, ROE3) is shown in Table 8.

It can be noted that the indicator of the efficiency of visible IC (Eiag) had a positive and statistically significant impact on the rate of return on equity 1 (ROE1). An increase in the efficiency of visible IC (Eiag) by 1 contributes to an increase in the rate of return on equity 1 (ROE1) by 0.0001369. The results of the model with constant regression parameters (Pooled) confirm that the model is statistically significant at the 1% significance level. This model explained 9.09% of changes in the value of return on equity 1 (ROE1).

Table 8. Results of regression analysis

Independent variable	Dependent variable		
	ROE1	ROE2	ROE3
constant	0.0308525 [13.22] (0.000)	0.0977841 [5.89] (0.000)	0.0378839 [10.25] (0.000)
Eiag	0.0001369 [3.13] (0.002)	0.0001775 [0.72] (0.471)	0.0002336 [3.37] (0.001)
R^2	0.0909		0.1040
$\overline{R^2}$	0.0817		0.0949
ρ		0.15117866	
F (Pooled); *Wald (REM)*	9.80 (0.0023)	0.52 (0.4713)	11.38 (0.0011)
Note: *t* and *z* statistic in [ ] *p-value* in ( )			

Source: Authors

When it comes to the impact of the visible IC efficiency indicator (Eiag) on the rate of return on equity 2 (ROE2), the corresponding model applied for the analysis is not statistically significant.

It can also be noted that the indicator of the efficiency of visible IC (Eiag) had a positive and statistically significant impact on the rate of return on equity 3

(ROE3). An increase in the efficiency of visible IC (Eiag) by 1 contributes to an increase in the rate of return on equity 3 (ROE3) by 0.0002336. The results of the model with constant regression parameters (Pooled) confirm that the model is statistically significant at the 1% significance level. This model explained 10.40% of the changes in the value of the rate of return on equity 3 (ROE3).

Considering the presented results, it can be concluded that *hypothesis 2a is partially confirmed.*

Table 9 shows the analysis of the influence of the visible IC efficiency indicator (Eiag) on the rate of return on total assets 1-4 (ROA1, ROA2, ROA3, ROA4).

Table 9. Results of regression analysis

Independent variable	Dependent variable			
	ROA1	ROA2	ROA3	ROA4
constant	0.0379791 [10.32] (0.000)	0.030597 [13.04] (0.000)	0.0295807 [12.95] (0.000)	0.0105084 [0.01] (0.988)
Eiag	0.0002233 [3.24] (0.002)	0.0001369 [3.11] (0.002)	0.0000751 [1.76] (0.082)	0.0024634 [0.19] (0.853)
R^2	0.0968	0.0900	0.0305	0.0004
$\overline{R^2}$	0.0876	0.0807	0.0206	-0.0098
F (Pooled)	10.50 (0.0016)	9.69 (0.0024)	3.08 (0.0822)	0.03 (0.8533)
Note: *t* statistic in [ ] *p-value* in ( )				

Source: Authors

It can be noted that the indicator of the efficiency of visible IC (*Eiag*) had a positive and statistically significant impact on the rate of return on total assets 1 (ROA1). An increase in the efficiency of visible IC (*Eiag*) by 1 contributes to an increase in the value of the rate of return on total assets 1 (ROA1) by 0.0002233. The results of the model with constant regression parameters (Pooled) confirm that the model is statistically significant at the 1% significance level. This model explained 9.68% of the changes in the value of the rate of return on total assets 1 (ROA1).

It can also be noted that the indicator of the efficiency of visible IC (*Eiag*) had a positive and statistically significant impact on the rate of return on total assets 2 (ROA2). An increase in the efficiency of visible IC (*Eiag*) by 1 contributes to an increase in the rate of return on total assets 2 (ROA2) by 0.0001369. The results of

the model with constant regression parameters (Pooled) confirm that the model is statistically significant at the 1% significance level. This model explained 9% of the changes in the value of the rate of return on total assets 2 (ROA2).

Then, the visible IC efficiency indicator (Eiag) had a positive and statistically significant impact on the rate of return on total assets 3 (ROA3). An increase in the efficiency of visible intellectual capital (Eiag) by 1 contributes to an increase in the rate of return on total assets 3 (ROA3) by 0.0000751. The results of the model with constant regression parameters (Pooled) confirm that the model is statistically significant at the 10% significance level. This model explained 3.05% of the change in the value of the rate of return on total assets 3 (ROA3).

Finally, the visible IC efficiency indicator (Eiag) had a positive and statistically insignificant impact on the rate of return on total assets 4 (ROA4). Based on the presented results, it can be concluded that *hypothesis 2b is partially confirmed*.

Based on the above-presented results of the regression analysis, Figure 2 depicts the verified hypotheses.

Figure 2. Summarised results of the hypothesis testing

Hypothesis 1 (H1)	Interdependence between the efficiency of visible intellectual capital (Eiag) and profitability indicators (ROE, ROA)
H1a (ROE1, ROE2, ROE3)	Partially confirmed (ROE1, ROE3)
H1b (ROA1, ROA2, ROA3, ROA4)	Partially confirmed (ROA1, ROA2, ROA3)
Hypothesis 2 (H2)	Impact of the efficiency of visible intellectual capital (Eiag) on profitability indicators (ROE, ROA)
H2a (ROE1, ROE2, ROE3)	Partially confirmed (ROE1, ROE3)
H2b (ROA1, ROA2, ROA3, ROA4)	Partially confirmed (ROA1, ROA2, ROA3)

Source: Authors

Based on the results presented in Figure 2, it can be concluded that Hypothesis 1 (H1), which assumes that there is a positive relationship between the efficiency of visible IC or Efficiency in the use of intangible assets and goodwill (Eiag) and the profitability of the company measured by different ROE and ROA indicators, is partially confirmed. Namely, Hypothesis 1a (H1a) is partially confirmed, i.e., there is a positive relationship between the efficiency of visible IC (Eiag) and the rate of return on equity 1 and 3 (ROE1, ROE3), but it is absent when it comes to the

interdependence between the efficiency of visible IC (Eiag) and the rate of return on equity 2 (ROE2). Also, Hypothesis 1b (H1b) is partially confirmed, that is, there is a positive relationship between the efficiency of visible IC (Eiag) and the rate of return on total assets 1-3 (ROA1, ROA2, ROA3). However, a statistically significant relationship between the efficiency of visible IC (Eiag) and the rate of return on total assets 4 (ROA4) is not established.

When it comes to Hypothesis 2 (H2), which assumes that there is a positive influence of the efficiency of visible IC or Efficiency in the use of intangible assets and goodwill (Eiag) on the profitability of the company measured by different ROE and ROA indicators, it can be concluded that it is partially confirmed considering the results presented in Figure 2. Hypothesis 2a (H2a) is partially confirmed, i.e., growth in the efficiency of visible IC (Eiag) has a positive impact on return on equity 1 and 3 (ROE1, ROE3), but there is not a statistically significant impact of the efficiency of visible IC (Eiag) on return on equity 2 (ROE2). Hypothesis 2b (H2b) is also partially confirmed, that is, growth in the efficiency of visible IC (Eiag) has a positive impact on return on assets 1-3 (ROA1, ROA2, ROA3), but there is no statistically significant impact on the efficiency of visible IC (Eiag) on return on assets 4 (ROA4).

4. Conclusion

The previously presented outcomes in this paper cannot be contrasted to the results of other studies as there are no previous studies of other researchers that have applied *Eiag* formulae in the EIC model and IC efficiency indicators. Findings of other research papers mainly used the VAIC method (Tiwari, 2022; Yin & Xu, 2022; Prasojo, Yadiati, Fitrijanti, & Sueb, 2022, Ovechkin, Romashkina & Davydenko, 2021; Ognjanović, Krstić, Radjenović, & Jovanović Vujatović, 2022) which is a very criticized measurement methodology (Stahle, Stahle & Aho, 2011; Iazzolino, & Laise, 2013, Bakhsha, Afrazeh & Esfahanipour, 2017; Nadeem & Zaman, 2021; Marzo, 2022). The VAIC model (Pulić, 2004) points out the efficiency of the use of the total capital (intellectual - human and structural, physical, and financial) measured by the VAIC indicator (Value-Added Intellectual Coefficient - VAIC) and explains that IC adds value to other engaged physical and financial resources, which is disclosed on the assets side in the balance sheet. Pulić (2004) calculated this indicator in the following way: *VAIC = ICE + CEE*, using the ICE as an indicator of invisible IC efficiency, while CEE is an indicator of the efficiency of other employed capital - physical and financial, as well as recorded current and non-current asset (which include visible (disclosed) intellectual resources on the assets side of the balance sheet - Intangible assets and Goodwill). Pulić's VAIC method does not separate the visible IC component i.e. Intangible Assets and Goodwill (Iag), but *Iag* is incorporated in the total Assets (*As*).

The VAIC coefficient, according to Pulić, measures the overall efficiency of enterprises. Invisible IC efficiency (*ICE*), according to Pulić, is the sum of coefficients of the efficiency of human capital (*HCE*) and the efficiency of structural capital (*SCE*) (Pulić, 2004): *ICE = HCE + SCE*. Also, Pulić does not consider the relational capital as a segment of total IC, or more precisely, the element of *IC* that is not shown in the assets of the balance sheet *(*Δ*IC)* in the EIC methodology (Krstić, 2014; Krstić & Bonić, 2016). Namely, in the VAIC model, the category of *Intangible assets and Goodwill* (visible IC) doesn't exist as a separate component. Also, the VAIC model does not separately compute the efficiency of visible IC – *Eiag*, but computes the efficiency of the use of the total asset in the *CEE* indicator. In accordance with previous facts and explanations of differences between VAIC and EIC methodology initially developed by Krstić (2014), the results of this research paper (based on the EIC model IC efficiency measurement) are not comparable with other papers which are mainly their empirical investigation granted on the implementation of VAIC model, because there are differences in the approaches of calculation of partial efficiency indicators. Namely, the EIC model suggests formulae for *Eiag*, *Ehc, Esrc* and *Eic*, while the VAIC model suggests formulae for *HCE, SCE* and *ICE*.

The results of this research of 12 leading companies in the automotive industry from 2010 to 2019, confirm positive relations between the efficiency in the use of intangible assets and goodwill (Eiag) and profitability (ROA and ROE), as well as the growing impact of Eiag on the increase of profitability indicators (ROA and ROE). The outcomes of the research imply the extreme importance of effective and efficient management of all elements of intellectual assets that are disclosed in the balance sheet, taking into account the evident impact on profitability.

The advantages of this study are based on the use of the EIC methodology (Krstić, 2014; Krstić & Bonić, 2016) and the calculation of the *Eiag* indicator. The EIC methodology shows an advantage in relation to the VAIC methodology (Krstić, Bonić, Rađenović, Jovanović Vujatović & Ognjanović, 2023), and this study has an advantage in relation to other studies which have not investigated the interdependence of *Eiag* and different indicators for measuring *ROE* (ROE1, ROE2, ROE3), different indicators for measuring *ROA* (ROA1, ROA2, ROA3, ROA4), as well as the impact of *Eiag* on various indicators for measuring *ROE* (ROE1, ROE2, ROE3), and on various indicators for measuring *ROA* (ROA1, ROA2, ROA3, ROA4).

In addition, the advantage of this study is reflected in the fact that tested hypotheses involve as dependent variables profitability indicators ROE and ROA, while the numerators in those ratios are *EBIT* and *EBITDA* (Krstić, 2022; Janjić, Krstić, & Milanović, 2022). *EBIT* as an economic and accounting category has an advantage in relation to other profit categories (Operating profit or Net income) because *EBIT* is useful for the purpose of comparison among companies with the differences in internal financing policy which affects interests' expenses, as well as

companies from different countries with different tax system. *EBITDA* as an economic and accounting category has advantages for the purpose of benchmarking companies from different internal financing policies, different proportions of material and non-material resources, and operating in different countries with different tax systems.

The implications for company management are also crucial, pointing out the fact that intangible assets should be intelligently directed, as it is a core factor of profitability, and this fact led to the conclusion that intangible assets determine the future competitive position on the market and creation of the value for stakeholders. Managers who are responsible for resource base growth and development, corporate level managers, especially managers of functional departments, as well as research and development managers and intellectual property managers, should make effective and efficient business decisions in line with intangible assets. The main issue is the efficient management of additional education and permanent training program to enhance knowledge and improve the skills that should provide innovativeness, loyalty, creativity and better work productivity which lead to higher profitability. Crucial determinants of intangible asset creation and increase in the efficiency in the use of intangible assets for higher profitability are efficient intellectual property management, efficient innovation and R&D management, and efficient information management (systems and databases).

The number of companies used in the analysis is the main limitation of the study. Therefore, in order to validate the suggested methodology and conceptual framework, future research might focus on a more inclusive sample encompassing a wide range of companies from different industries.

References

Alarussi, A. S., & Gao, X. (2021). Determinants of profitability in Chinese companies. *International Journal of Emerging Markets*.

Arrighetti, A., Landini, F., & Lasagni, A. (2014). Intangible assets and firm heterogeneity: Evidence from Italy. *Research Policy*, *43*(1), 202-213.

Bakhsha, A., Afrazeh, A., Esfahanipour, A. A Criticism on Value Added Intellectual Coefficient (VAIC) Model. *IJCSNS International Journal of Computer Science and Network Security* 2017, 17(6), 59-71.

Bhattacherjee, A. (2012). *Social Science Research: Principles, Methods, and Practices*. Textbooks Collection. Tampa, Florida: University of South Florida, Scholar Commons.

Bontis, N (1998). Intellectual capital: an exploratory study that develops measures and models. *Management Decision*, Vol. 36, No. 2, pp. 63-76.

Cohen, J. (1988). *Statistical Power Analysis for the Behavioral Sciences*. Hillsdale, NJ: Lawrence Erlbaum Associates.

Corrado, C., Hulten, C., & Sichel, D. (2005). Measuring capital and technology: an expanded framework. In *Measuring capital in the new economy* (pp. 11-46). University of Chicago Press.

Delios, A., & Beamish, P. W. (2001). Survival and profitability: The roles of experience and intangible assets in foreign subsidiary performance. *Academy of Management journal*, *44*(5), 1028-1038. https://doi.org/10.5465/3069446

Edvinsson, L. & Malone, M.S. (1997). *Intellectual Capital: Realizing Your Company's True Value by Finding Its Hidden Roots.* New York: HarperCollins Publishers, Inc.

FRC (2022a). FRED 82 Draft amendments to FRS 102 The Financial Reporting Standard applicable in the UK and Republic of Ireland and other FRSs - Periodic Review, available at: https://www.frc.org.uk/getattachment/77881580-92bb-40c5-9dfa-a80029d857f7/FRED-(Redacted).pdf (accessed August, 15, 2023)

FRC (2022b). Overview of the financial reporting framework (January 2022), available at: https://www.frc.org.uk/getattachment/8ee72436-f78a-4960-a8d1- (accessed August, 15, 2023)

FRS 102, available at: https://www.frc.org.uk/getattachment/c66c1d97-5943-413c-b354-f122e07f144d/Redacted-FRS-102-(January-2022).pdf (accessed August, 15, 2023)

FRS 105, available at: https://www.frc.org.uk/getattachment/8211deb4-792a-453c-94b8-501f49d39694/Redacted-FRS-105-(January-2022).pdf (accessed August, 15, 2023)

Galbreath, J. (2002). Twenty-first century management rules: the management of relationships as intangible assets, *Management Decision*, Vol. 40 No. 2, pp. 116-126. https://doi.org/10.1108/00251740210422794

IAS 36 Intangible Assets, available at: https://www.ifrs.org/content/dam/ifrs/publications/pdf-standards/english/2021/issued/part-a/ias-36-impairment-of-assets.pdf (accessed August, 15, 2023)

IAS 38 Intangible Assets, available at: https://www.ifrs.org/content/dam/ifrs/publications/pdf-standards/english/2021/issued/part-a/ias-38-intangible-assets.pdf, (accessed August, 15, 2023)

Iazzolino, G., Laise, D. Value added intellectual coefficient (VAIC): A methodological and critical review. *Journal of Intellectual Capital* 2013, 14 (4), 547-563. DOI: 10.1108/JIC-12-2012-0107

IFRS 3. Business Combination, available at: https://www.ifrs.org/content/dam/ifrs/publications/pdf-standards/english/2022/issued/part-a/ifrs-3-business-combinations.pdf?bypass=on; (accessed August 15, 2023)

IFRS, available at: www.ifrs.org/ (accessed August, 15, 2023)

Janjić, I., Krstić, B., & Milanović, S. (2022). THE IMPACT OF R&D ACTIVITY ON THE BUSINESS PERFORMANCE OF HIGH-TECHNOLOGY COMPANIES. *Facta Universitatis, Series: Economics and Organization*, 253-271.

Jovanović, M., Petrović, B., & Janjić, I. (2021). Key determinants of sustainable intellectual capital of enterprises. *Economics of sustainable development*, *5*(1), 13-22.

Jovičić, M., & Dragutinović Mitrović, R. (2011). *Ekonometrijski metodi i modeli*. Beograd: Univerzitet u Beogradu, Ekonomski fakultet, Centar za izdavačku delatnost.

Krstić, B. & Bonić, Lj. (2016). EIC: A new tool for intellectual capital performance measurement. *Prague Economic Papers*, Vol. 25, No. 6, pp. 723-741.

Krstić, B. (2014). *Upravljanje intelektualnim kapitalom preduzeća.* Niš: Ekonomski fakultet.

Krstić, B., (2022). *Upravljanje poslovnim performansama*. Kragujevac: Ekonomski fakultet

Krstić, B., Bonić, Lj., Rađenović, T., Jovanović Vujatović M., & Ognjanović J., (2023) Improving Profitability Measurement: Impact of Intellectual Capital Efficiency on Return on Total Employed Resources in Smart and Knowledge-Intensive Companies, *Sustainability*, 15, 12076. https://doi.org/10.3390/ su151512076

Marrocu, E., Paci, R., & Pontis, M. (2012). Intangible capital and firms' productivity. *Industrial and corporate change*, *21*(2), 377-402. https://doi.org/10.1093/icc/dtr042

Marzo, G. A theoretical analysis of the value-added intellectual coefficient (VAIC). *Journal Management and Governance* 2022, 26, 551–577. DOI: 10.1007/s10997-021-09565-x

Nadeem, M., Zaman, R. Measuring intellectual capital efficiency: going beyond the VAIC model. *Research Handbook on Intellectual Capital and Business* 2021, 255-272. DOI: 10.4337/9781785365324

Ocak, M., & Fındık, D. (2019). The impact of intangible assets and sub-components of intangible assets on sustainable growth and firm value: evidence from Turkish listed firms. *Sustainability*, *11*(19), 5359.

Ognjanović, J., Krstić, B., Radjenović, T., & Jovanović Vujatović, M. (2022). Intellectual capital efficiency as the determining factor of sustaining profitability in the Covid-19 pandemic conditions: Does the age of the enterprise matter in the hotel industry?. *Annals of Spiru Haret University. Economic Series*.

Ordonez de Pablos, P. (2004). A guideline for building an intellectual capital statement: the 3R model. *International Journal of Learning and Intellectual Capital*, Vol. 1, No. 1, pp. 3-18.

Ovechkin, D.V.; Romashkina, G.F.; Davydenko, V.A. The Impact of Intellectual Capital on the Profitability of Russian Agricultural Firms. *Agronomy* 2021, *11*, 286. doi: 10.3390/agronomy11020286

Pallant, J. (2009). SPSS priručnik za preživljavanje (prevod 3. izdanja). Beograd: Mikro knjiga.

Petković, M., Krstić, B., Rađenović, T. (2020). Accounting-based valuation methods of intangible assets: theoretical overview. *Ekonomika*, 66(1), 1-12. DOI: 10.28934/ea.21.54.1., pp. 104-117.

Prasojo, P.; Yadiati, W.; Fitrijanti, T.; Sueb, M. (2022) Cross-Region Comparison Intellectual Capital and Its Impact on Islamic Banks Performance. *Economies*, *10*, 61. doi: 10.3390/economies10030061

Pulic, A. (2004). Intellectual capital - does it create or destroy value? *Measuring Business Excellence*, 8(1), 62-68. DOI: 10.1108/13683040410524757

Roos, G. & Roos, J. (1997). Measuring your Company's Intellectual Performance. *Long Range Planning*, Vol. 30, No. 3, pp. 413-426.

Stahle, P., Stahle, S., Aho, S. Value added intellectual coefficient (VAIC): a critical analysis. *Journal of Intellectual Capital* 2011, 12(4), 531–551. DOI: 10.1108/14691931111181715

Tiwari, R Nexus between intellectual capital and profitability with interaction effects: panel data evidence from the Indian healthcare industry. *Journal of Intellectual Capital* 2022, 23(3), 588-616. DOI: 10.1108/JIC-05-2020-0137

Tsai, C. F., & Yen, D. C. (2010). Discovering important factors of intangible firm value by association rules. *The International Journal of Digital Accounting Research*, *10*, 55-85.

Tsai, C. F., Lu, Y. H., & Yen, D. C. (2012). Determinants of intangible assets value: The data mining approach. *Knowledge-Based Systems*, *31*, 67-77.

UK GAAP, available at: https://www.icaew.com/technical/corporate-reporting/uk-gaap (accessed August 14, 2023)

US GAAP. FASB Accounting Standards Codification, available at: https://asc.fasb.org/ (accessed August 12, 2023)

Weetman, P. *Financial Accounting*. Harlow, England: FT Prentice Hall, Financial Times, 2003.

Yallwe, A. H., & Buscemi, A. (2014). An era of intangible assets. *Journal of Applied Finance and Banking*, *4*(5), 17.

Zainudin, R., Ahmad Mahdzan, N.S. & Leong, E.S. (2018). Firm-specific internal determinants of profitability performance: an exploratory study of selected life insurance firms in Asia, *Journal of Asia Business Studies*, Vol. 12 No. 4, pp. 533-550. https://doi.org/10.1108/JABS-09-2016-0129

Zhang, N. (2017). Relationship between intangible assets and financial performance of listed telecommunication firms in China, based on empirical analysis. *African Journal of Business Management*, *11*(24), 751-757.

DA LI EFIKASNA UPOTREBA „VIDLJIVOG“ INTELEKTUALNOG KAPITALA DETERMINIŠE RENTABILNOST AUTOMOBILSKE INDUSTRIJE?

Apstrakt: Intelektualni kapital je jedna od ključnih determinanti stvaranja vrednosti i unapređenja konkurentnosti preduzeća. Efikasno upravljanje svim vidljivim i skrivenim elementima ukupnog intelektualnog kapitala je od izuzetnog značaja za poslovni uspeh preduzeća, jer efektivno obezbeđivanje, kreiranje, razvoj i efikasna upotreba intelektualnih resursa utiču na različite poslovne performanse, kao što su: prihod, tržišno učešće, neto dobit i rentabilnost merenu stopom prinosa na ukupnu aktivu (ROA) i stopom prinosa na sopstveni kapital (ROE). Jedan deo ukupnog intelektualnog kapitala je prikazan i vidljiv u aktivi bilansa stanja kao Nematerijalna imovina i gudvil (Iag), dok je drugi, nevidljiv, neprikazan, i to u vidu Humanog (ljudskog) kapitala (Hc) i Strukturnog i relacionog kapitala (SRc). Efikasnost u upotrebi svih ovih resursa ima uticaja na rentabilnost poslovanja. Svrha ovog istraživanja je da na uzorku 12 vodećih kompanija automobilske industrije za period od 2010. do 2012. godine ispita međuzavisnost, kao i uticaj efikasnosti nematerijalne imovine i gudvila (Eiag) na različite indikatore za merenje performansi stope prinosa na (ROA) i stope prinosa na sopstveni kapital (ROE), primenom EIC (Efficiency of Intellectual Capital) modela za izračunavanje indikatora - Efikasnost u upotrebi nematerijalne imovine i gudvila (Eiag). Iako postoje brojna istraživanja koja koriste VAIC metodologiju za ispitivanje međuzavisnosti i uticaja efikasnosti pojedinih elemenata intelektualnog kapitala na poslovne performanse, kao i, posebno, na rentabilnost, ovaj rad je originalan jer istražuje međuzavisnost i uticaj efikasnosti u upotrebi vidljivog intelektualnog kapitala (Eiag) na rentabilnost (ROA and ROE), što nije slučaj sa studijama drugih istraživača do sada, jer Pulićeva VAIC metodologija ne izdvaja posebno komponentu vidljivog intelektualnog kapitala – Nematerijalna imovina i gudvil (Iag). Rezultati ovog

istraživanja na uzorku 12 vodećih kompanija automobilske industrije za period od 2010. do 2012. godine, pokazuju da postoji pozitivan odnos između efikasnosti nematerijalne imovine i gudvila (Eiag) i rentabilnosti (ROA i ROE), kao i da je povećanje indikatora Eiag od uticaja na povećanje rentabilnosti (ROA i ROE). Stoga, ovakvi rezultati istraživanja impliciraju na izuzetnu važnost efektivnog i efikasnog upravljanja svim intelektualnim resursima čija je vrednost prikazana u aktivi bilansa stanja imajući u vidu evidentan uticaj na rentabilnost poslovanja.

Ključne reči: intelektualni kapital, nematerijalna imovina, gudvil, menadžment, profitabilnost, automobilska industrija.

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