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The Impact of Intellectual Capital Efficiency on Company Performance and Firm's Value

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Abstract

Business competition forces companies to strengthen their competitive advantage to survive and grow sustainably. Companies that survive in the competition will impact company performance and firm value. The factor that is thought to influence the company's competitive advantage is intellectual capital. This study aims to prove the effect of intellectual capital efficiency on financial performance and firm value. The method used is quantitative explanatory. The variable Intellectual Capital is measured by the VAIC (Value Added Intellectual Coefficient) method developed by Pulic (2000), company performance is measured by Return on Equity (ROE) and Earnings per Share (EPS), and the Firm's Value is measured by Tobin's Q. Using purposive sampling on a population of 766 companies listed on the Indonesia Stock Exchange, this study took a sample of 409 companies using data from 2017 to 2021. The data were processed using Pearson Correlation Product Moment statistical tests and Single Linear Regression. The results show that Intellectual Capital efficiency significantly affects a company's performance with a correlation level of 0.479 and an explanation rate of 37.3%; Intellectual Capital efficiency significantly affects firm value with a correlation level of 0.412 and an explanation rate of 41.83%. With segregated data, the result shows that the explanatory level in the technology and finance industry is greater than in other industries.

Keywords
intellectual capital efficiency; company performance; firm's value; explanation rate

I. Introduction

Today, global economies are transitioning from manufacturing to economic activity based on information. Knowledge is the single significant element of production that is superior to land, labor, and capital. The distinctive contribution of management in the 20th century was the 50-fold rise in the productivity of manual workers via the transformation of labor-intensive economies into industrial economies. In the 21st century, management has contributed to increased knowledge worker productivity and a transition from production equipment to knowledge labor. The economic condition of the population is a condition that describes human life that has economic score (Shah et al, 2020). Economic growth is still an important goal in a country's economy, especially for developing countries like Indonesia (Magdalena and Suhatman, 2020).

However, the corporate performance evaluation system goes back to the manufacturing era, is primarily focused on financial and physical elements, and lacks important data on intellectual capital performance (IC). Many monitoring techniques are required to enhance the efficiency of a company's intangible assets. In an economic based-knowledge, IC is vital to the competitiveness of many businesses, regardless of their sector. Utilizing resources efficiently is a crucial factor in establishing the company's strength. Measuring the impact of intellectual capital has become a crucial problem for

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businesses today, as it may assist the public in understanding intangible assets. A good performance assessment tool might offer organizations the information required to develop an action plan to increase intellectual capital's contribution to the company's success.

Because IC may be a substantial factor in determining a company's market value, firms must manage their intellectual capital efficiently and effectively (Alkhateeb et al., 2018). IC has become a dilemma in accounting development because, although it is a major predictor of market value, there is no mutually agreed-upon standard for measurement and recognition or concept of IC. Consequently, numerous methods for assessing IC have arisen. According to resources-based theory, it is anticipated that all components of IC will contribute to market value if effective intellectual capital management is achieved (Xu and Feng, 2020). The enhancement of the firm's value will result in the enhancement of its competitiveness, hence enhancing its financial performance. A firm's financial success is represented in its rate of return and the market's opinion of its value, which is reflected in the price of its shares.

This research aims to explain how effective intellectual capital management affects a company's market value and financial results. Understanding the significance of effective intellectual capital management to provide the firm a competitive advantage and raise its market value is considered a major benefit of this study for all stakeholders, especially investors (Jardon, 2015). In this research, ROE was selected because it may demonstrate how effectively a firm utilizes investment capital to achieve revenue growth (Xu et al., 2021). While EPS can indicate the business's performance, it can be determined by the company's capacity to distribute earnings to shareholders. EPS describes the amount of rupiah earned for each share of common stock. According to the signaling theory, the company's management, ordinary shareholders, and prospective shareholders are generally extremely interested in EPS since it indicates the amount of rupiah earned per share of common stock.

In Indonesia, the number of research about intellectual capital is very various. Compared to previous studies, the main novelty in this study is the use of the number of companies samples, the sample's character, the types of variables, and the length of the data period used.

II. Review of Literature

2.1 The Efficiency Principle

The efficiency principle is an economic concept stating that any activity produces the maximum value to society when the marginal gains from the allocation of resources are similar to its marginal social cost. It gives the theoretical framework for cost-benefit analysis, which is how most decisions about allocating resources are made. By the Efficient Market Hypothesis (EMH), the capital market is efficient when the prices of all traded securities reflect all available information. This data includes information that is known and relevant for evaluating stock prices. The capital market is efficient when the price of a stock responds rapidly to new information. Consequently, the stock price reflects all available information. The greater the correlation between stock price and market data, the more precisely the market condition is formed (Bhattacharjee and Akter, 2022).

2.2 Modified Value-Added Intellectual Coefficient (M-VAIC)

According to research by Ulum (2014), the M-VAIC model starts by evaluating the company's capacity to produce value-added (VA), which is the effectiveness of human capital (HC), structural capital (SC), relational capital (RC), and capital employed (CE) (CE). According to Pulic's (2000) study, VA may be determined by adding Operating Profit (OP), Employee Cost (EC), Depreciation (D), and Amortization (A). The process of value creation efficiency (VA) is controlled by the efficiency of four components, the sum of which will comprise the M-VAIC indicator:

a. Human Capital Effectiveness (HCE). HCE indicates the amount of VA that can be produced for the cost of labor, while HC's proxy is salary and employee benefits.
b. Structural Capital Efficiency (SCE) illustrates structural capital's (SC) role in value generation. SCE indicates the quantity of SC required to make 1 rupiah of VA. The more significant the contribution of HC to value creation, the less the contribution of SC, where SC equals VA minus HC. Combining HCE, SCE, and RCE will result in Intellectual Capital Efficiency (ICE).
c. Relational Capital Efficiency (RCE) is an extra component introduced by Ulum (2014) for calculating intellectual capital performance. RCE is the quantity of RC required to make 1 Rupiah of VA. Tandelilin (2010) utilizes the company's marketing expenses to indicate the RC.
d. Capital Employed Efficiency (CEE). CEE illustrates the contribution of each CE unit to VA. According to Pulic (2000), if one unit of CE delivers a higher return than other companies in the same industry, the firm is using its CE more effectively.

2.3 Intellectual capital in terms of effectiveness

Intellectual capital is increasingly being studied as more companies invest in knowledge and intellectual aspects that can increase company profits. There have been many attempts to define the term IC. Generally, IC is defined as the creative abilities of the human brain or mind. Edvinson and Malone (1997) in Alvarez et al. (2020) define IC as "knowledge that can be converted into value." They also explain that the difference between market value and book value is the value of IC. IC means individual workers' and organizational knowledge contributing to sustainable competitive advantage. He further elaborates that IC, in a broad sense, consists of human capital and structural capital. Pulic (2000) includes all employees' abilities that add value to IC. Due to the identification and measurement problems, IC efficiency management is a complex process (Ulum, 2014). Therefore, using traditional performance measurement methods such as the uni-dimensional financial ratios analysis, which is with subjectivity issue, is not sufficient to analyze the effect of IC on corporate performance (Sowaity, 2022). In contrast, DEA allows multiple inputs and outputs to be evaluated concurrently. Furthermore, preliminary information about the relationship among numerous performance measures is not required in DEA, a technique that objectively accommodates interactions among various performance measures (Parlak, 2021).

2.4 Relationship between Intellectual Capital and the company performance

Financial performance is the definition of a company's financial state used to assess whether or not a company's actual financial condition is examined using financial analysis. The definition of financial performance is the accomplishments of a corporation during a certain time, as reported in its financial statements. In addition, financial performance evaluation is defined as meeting funders' responsibilities and achieving business objectives (Chowdhury, 2019). If the company's capacity to manage and deploy its resources reflects

its financial success, its financial performance will be positive. Because of its effective abilities, the corporation may effectively manage its assets for operational operations to generate profits (Nugrahaeni and Syafruddin, 2022). A company's performance according to the established benchmarks is created over a certain period. In assessing the performance of a company's operations, it is planned to evaluate how the activity's performance and the end outcomes obtained compare.

Many studies have been identified based on the literature analysis examining how intellectual capital affects financial performance and business value utilizing different analytical techniques, samples, and data periods. The Extended Value-Added Intellectual Capital plus method and the Investment Opportunity Set are used by Tarigan et al. 2019 to assess Intellectual Capital Performance, which affects financial performance. According to the study, an investment opportunity set will increase the company's financial performance in terms of profitability, and intellectual capital substantially impacts performance. Value Added Intellectual Coefficient (VAIC) Model was used to calculate by Tandelilin (2010), and Panel Data Analysis was used to determine how well intellectual capital performed and what factors contributed to financial success. The effectiveness of intellectual capital has been shown to affect financial success, according to the research's conclusions. The effectiveness of intellectual capital and organizational performance in Bangladesh's pharmaceutical industry was compared by Brown (2020). The components of the value-added intellectual coefficient strongly explained asset turnover and return on assets, but they could not forecast the outcome for return on equity. Pulic (200) stated that the influence of intellectual capital on the company's performance is projected by human capital, structure capital, capital employed, and relational capital. Empirical research shows that human capital, capital structure, and capital employed positively affect company performance. At the same time, relational capital does not affect the company's performance.

2.5 Relationship between intellectual capital and the firm's value

Based on the literature review, many studies have been found exploring the impact of intellectual capital efficiency on firm value using various analytical methods, types of samples, and data periods.

Solechan's (2017) research examines the relationship between intellectual capital efficiency (ICE) and the corporate market to book value from the population of all non-financial firms listed in the Amman stock exchange across the years (2013 - 2017). The main results reveal a significant relationship between each human capital efficiency (HCE), structural capital efficiency (SCE), and capital employed efficiency (CEE) as elements of the value-added intellectual capital model (VAIC) and the corporate market to book value.

Azlina et al. (2018) study aim to frame the affinity between intellectual capital efficiency and different dimensions of business performance - financial, market, and economic. Using the lens of the resource-based view (RBV), the underlying study observes a positive connection of VAIC with companies' financial and economic performance. In contrast, it is non-significant with the market valuation. The study also reveals that among VAIC components, the efficiency of physical capital is the most influential element for predicting business performance.

Ousama and Fatima (2015) research analyzed Turkey's finance sector's 2016 - 2020 data and determined that intellectual capital efficiency affects financial performance. Sowaity's (2022) research use data from Indonesia-listed service companies. The samples of this study were 109 companies. The results support the hypothesis that the company's IC

affects the company's market valuation. In addition, the authors found that the company's financial performance is a full mediator in the relation between the company's intellectual capital efficiency and market valuation.

2.6 The company performance and firm's value

To maximize the company's value, the company must consider its investors; the value of the company measures the success of implementing financial functions. Profitability reveals an organization's performance evaluation. Profit is not only an indicator of the company's ability to meet its obligations to its investors but also a factor in creating corporate value that reveals the company's prospects.

Ousama and Fatima (2015) measured that the human capital efficiency of the Islamic banking sector in Malaysia was higher than the efficiency of structural capital and capital used and that intellectual capital affected profitability. A study conducted by Joshi et al. (2013) over the data period 2006 - 2008 on the Australian financial sector determined that the value creation efficiency of the financial industry is strongly influenced by human capital. On the other hand, financial performance is a term used to define the robustness of a firm's financial structure and the degree to which assets are accessible, and the organization can generate a profit. This is strongly tied to the management's capacity to manage the company's resources successfully and efficiently.

III. Research Method

This research is explanatory research by measuring the relationship between two variables. The company's performance in this study is represented by the profitability ratio, namely ROE and EPS, and the company's value through Tobin's Q ratio.

This intellectual capital research uses the method M-VAIC developed by Ulum et al. (2014), a modification of the VAIC model developed by Pulic (2000). There is an additional RCE (Relational Capital Efficiency) component so that the VAIC calculation uses two capital components, namely Capital Employed Efficiency (CEE) and Intellectual Capital Efficiency (ICE), which is an addition to Human Capital Efficiency (HCE), Structural Capital Efficiency (SCE), and Relational Capital Efficiency (RCE).

This empirical research will examine the effect of intellectual capital efficiency as measured by the VAIC^{TM} component (ICE and CEE) on company performance which in this case is measured by ROE and EPS, and firm value as proxied by Tobin's Q.

The operationalization of variables in the study is presented in Table 1.

Table 1. Operationalization of the variables

Variable	Construct	Indicator	Measurement
Independent	M-VAIC	ICE (X_1)	VA = Output - Input HCE = VA / HC SCE = SC/ VA RCE = RC / VA ICE = HCE + SCE + RCE
		CEE (X_2)	CEE = VA / CE
Dependent	Company Performance	ROE (Y_1)	ROE = Net Profit / Total Equity
		EPS (Y_2)	EPS = Net Profit / Number of Equity Shares
	Firm Value	Tobin's Q (Y_3)	Q = (MVS + D)/ TA

Profitability is key to defining a company's financial success and performance indicators. Various indicators are in the form of ratios, such as the Return on Equity (ROE) and Earning per Share (EPS).

ROE describes how companies can maximize their company equity to improve performance. In the research model, ROE can become an indicator that can describe company profitability based on the equity it owns.

Increasing intellectual capital is the strategy for increasing the firm's value by encouraging its financial performance. Firms with profitability will get a better valuation from investors, and this performance may be improved by using intellectually based intellectual capital.

3.1 Data

The technique used in developing the sample is purposive sampling. The population of this research is all companies listed on the Indonesian Stock Exchange in the 2017 - 2021 periods.

Through purposive sampling, samples will be selected for the research objectives. Secondary data are acquired from www.idx.co.id.

Industry data segregation is based on industry classification determined by the Indonesian Stock Exchange.

3.2 Analysis

Once the data is collected, then analyzed the data. Data processing and data analysis in this study uses a single regression model. The data were processed using Pearson Correlation Product Moment statistical tests and Single Linear Regression.

All data will be tested through the statistical description, followed by a classical assumption test and linear regression.

To see the degree of closeness of the correlation between the two research variables that are normally distributed, the Pearson Correlation Product Moment is used.

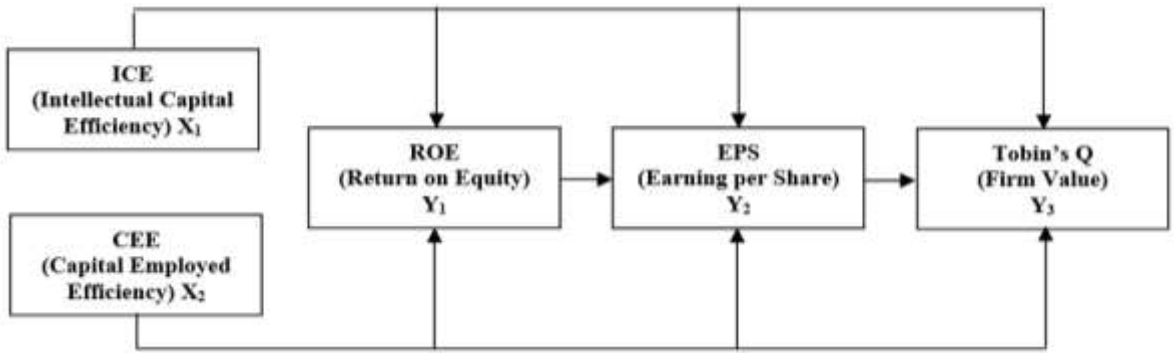

Figure 1. *Analysis Models*

Thus, in Fig. 1, it is assumed that there is a positive relationship between intellectual capital with firm performance and firm value; based on this theory, a hypothesis is proposed as follows:

H_1 ICE has a positive significant effect on ROE.
H_2 ICE has a positive significant effect on EPS.
H_3 ICE has a positive significant effect on Tobin's Q.
H_4 CEE has a positive significant effect on ROE.
H_5 CEE has a positive significant effect on EPS.
H_6 CEE has a positive significant effect on Tobin's Q.

The regression model used in this study is in Table 2:

Table 2. Regression Equation models

No.	Regression Equation
1	$ROE = \alpha + \beta_1 ICE + \varepsilon$
2	$EPS = \alpha + \beta_1 ICE + \varepsilon$
3	$Tobin's\ Q = \alpha + \beta_1 ICE + \varepsilon$
4	$ROE = \alpha + \beta_1 CEE + \varepsilon$
5	$EPS = \alpha + \beta_1 CEE + \varepsilon$
6	$Tobin's\ Q = \alpha + \beta_1 CEE + \varepsilon$

IV. Result and Discussion

4.1 Research Sample Descriptives

The sampling technique in this research is purposive sampling based on the criteria that have been determined.

The sample of this study is 409 companies listed on the Indonesia Stock Exchange from 2017 - 2021. Table 3 reports the descriptive statistic of each variable.

Table 3. Descriptive Statistic

	HCE	SCE	CEE	ROE	EPS	Tobin's Q
Minimum	1.432	0.947	0.387	0.037	0.492	0.0006
Maximum	5.421	4.429	1.335	0.432	2,462,124	18.642
Mean	3.170	2.092	0.637	0.073	197,435	1.192
Std. Deviation	1.596	0.532	0.310	0.049	131,083	0.629

From Table 3, all the variables of the combined samples have a mean value greater than the standard deviation.

Based on the description of the VAIC™ component data in Table 3, it can be concluded that HCE has the largest portion of value-added creation from intellectual capital efficiency.

The ROE indicator produces a mean value of 0.089 or 8.9%. This value shows that the mean value exceeds the standard ROE value of 8.32% (Lukviarman, 2006). Tobin's Q value is 1.080. This value indicates that the mean value of Tobin's Q in Indonesia is slightly greater than 1.0, and the market value is greater than the value of the company's recorded assets. The market is overvalued.

Table 4. Descriptive Statistic (Industry Classification)

	N	Mean					
		HCE	SCE	RCE	ROE	EPS	Tobin's Q
Energy	180	2.587	2.487	0.445	0.186	231.403	1.023
Basic Material	285	2.238	1.533	0.554	0.148	273.291	0.934
Industrials	150	2.428	1.992	0.663	0.187	150.291	0.954
Consumer Non-Cyclical	255	2.207	1.825	0.439	0.145	140.438	1.115
Consumer Cyclical	310	2.194	1.832	0.541	0.166	165.739	0.991
Healthcare	75	5.532	3.437	0.899	0.244	250.156	2.171

Financials	380	5.568	3.627	1.183	0.273	165.883	0.801
Properties and Real Estate	170	2.138	1.295	0.395	0.112	140.548	0.623
Technology	35	5.583	3.548	0.992	0.237	259.202	1.191
Infrastructures	150	3.104	1.819	0.546	0.173	240.326	1.173
Transportation & Logistic	55	2.141	1.806	0.573	0.098	220.183	0.909

From Table 4, the mean value of HCE from the technology sector is 5.583, which is larger than others. Human capital is the major focus of the technology industry, while the mean of properties and real estate sector is the smallest among the others. The added value in the technology industry with funds invested for employee salaries and benefits is 5.583. The reason could be that the technology sector depends on factors such as level and vocational skills. The mean value of SCE in the financial industry is 3.627 and the highest compared to others, which means the level of knowledge in financial companies such as company operating systems, business processes, organizational culture and management, and others.

4.2 Hypothesis Test

This study has passed the classical assumption test, and the hypothesis is tested.

Table 5. Regression result

	Regression	R	R^2	Adj. R^2	Conclusion
Hypothesis 1	$Y = 1.273 + 0.418X_1 + \varepsilon$	0.414	0.321	0.253	Accepted
t and Sig.	(3.293; 0.007)				
Hypothesis 2	$Y = 1.639 + 0.331X_1 + \varepsilon$	0.452	0.398	0.371	Accepted
t and Sig.	(3.761; 0.039)				
Hypothesis 3	$Y = 1.499 + 0.229X_1 + \varepsilon$	0.387	0.373	0.267	Accepted
t and Sig.	(3.717; 0.018)				
Hypothesis 4	$Y = 1.372 - 0.163X_1 + \varepsilon$	0.193	0.224	0.182	Rejected
t and Sig.	(1.819; 0.059)				
Hypothesis 5	$Y = 0.928 + 0.198X_1 + \varepsilon$	0.374	0.274	0.235	Accepted
t and Sig.	(2.752; 0.015)				
Hypothesis 6	$Y = 1.429 + 0.362X_1 + \varepsilon$	0.557	0.418	0.377	Accepted
t and Sig.	(3.625; 0.025)				

Based on the regression equation in Table 5, it is known that ICE has a significant positive relationship with each ROE, EPS, and Tobin's Q.

Meanwhile, the regression results also show that ICE's contribution to ROE is more significant than CEE. Another result related to ICE is a positive and significant effect on EPS and Tobin's Q (all coefficients are positive and sig. < 0.05). This confirms the hypotheses of H_1, H_2, and H_3. The results of this study show that ICE has a significant positive effect on the company's financial performance. It means the relationship between the company and its partners greatly affects the performance company's finances. The better the company's relationship with its partners, the higher its financial performance. Knowledge, skills, and competencies of human resources within the company must be improved to improve the company's financial performance. In addition, the company's routine processes and structures that support employees to produce optimal intellectual performance also need to be considered. The company must increase the competitive smart

capital, formulas, information systems, and company routine processes that support employees to produce optimal intellectual performance.

A negative coefficient indicates an opposite relationship between CEE and ROE. From the t-test, it is known that sig. > 0.05, then the hypothesis (H_4) is rejected. The results showed no significant effect between CEE and the company's performance as measured by ROE. The results related to CEE showed that the significant positive contribution to EPS and Tobin's Q differed from their correlation to ROE. These results also confirm that hypotheses 5 (H_5) and 6 (H_6) are accepted. The highest R^2 is 0.398 (ICE on EPS) and 0.418 (CEE and Tobin' Q). The highest Adjusted R^2 value is 0.371 from the ICE and EPS linear regression models and CCE. This shows that the ICE variable can explain the EPS variable higher than CEE, and ICE is better able to explain EPS than ROE and Tobin's Q.

Table 6. Regression result (Industry Classification)

	Regression	**R**	**R^2**	**Adj. R^2**
Energy	$Y = 1.273 + 0.418X_1 + \varepsilon$	0.414	0.361	0.313
t and Sig.	(3.293; 0.007)			
Basic Materials	$Y = 1.639 + 0.331X_1 + \varepsilon$	0.452	0.393	0.341
t and Sig.	(3.761; 0.039)			
Industrial	$Y = 1.499 + 0.229X_1 + \varepsilon$	0.347	0.273	0.227
t and Sig.	(3.717; 0.018)			
Consumer Non-Cyclical	$Y = 1.372 - 0.163X_1 + \varepsilon$	0.193	0.164	0.142
t and Sig.	(1.819; 0.049)			
Consumer Cyclical	$Y = 0.928 + 0.198X_1 + \varepsilon$	0.374	0.314	0.285
t and Sig.	(2.752; 0.015)			
Healthcare	$Y = 1.429 + 0.362X_1 + \varepsilon$	0.557	0.492	0.470
t and Sig.	(3.625; 0.025)			
Financials	$Y = 1.542 + 0.283X_1 + \varepsilon$	0.657	0.587	0.544
t and Sig.	(3.145; 0.017)			
Properties and Real Estate	$Y = 0.732 + 0.124_1 + \varepsilon$	0.311	0.292	0.257
t and Sig.	(1.525; 0.045)			
Technology	$Y = 1.471 + 0.362X_1 + \varepsilon$	0.697	0.625	0.571
t and Sig.	(3.711; 0.019)			
Infrastructure	$Y = 1.109 + 0.362X_1 + \varepsilon$	0.557	0.492	0.437
t and Sig.	(1.026; 0.042)			
Transportation and Logistic	$Y = 0.873 + 0.362X_1 + \varepsilon$	0.327	0.292	0.223
t and Sig.	(1.035; 0.037)			

From Table 6, the value of the industrial classification constant (β_0) is entirely positive; it is interpreted that there is a unidirectional effect between the ICE and CEE variables on company performance and firm value.

The R-Square (R^2) value in Table 6 shows the highest value in the technology sector, 62.5%, and the financial sector, 58.7%. With separate data, the results show that the explanatory level in technology and finance is greater than in other industries.

Table 7. Results of the Product Moment Correlation Test

No	Variable	r-value	r-table	Sig.	Coefficient value
1	X1 – Y1	0.338	0.045	0.006	0.114
2	X1 – Y2	0.429	0.045	0.041	0.184
3	X1 – Y3	0.479	0.045	0.019	0.201
4	X2 – Y1	0.263	0.045	0.062	0.069
5	X2 – Y2	0.327	0.045	0.017	0.107
6	X2 – Y3	0.412	0.045	0.027	0.175

Table 7 shows a significant correlation between the variables X_1-Y_1, X_1-Y_2, X_1-Y_3, X_2-Y_1, X_2-Y_2, and X_2-Y_3. The highest correlation is in X_1-Y_3 or the ICE variable with Tobin's Q with r-value of 0.449. However, one correlation is not significant (sig. > 0.05), namely the correlation between CEE and ROE. Through the coefficient value, 11.4% of the ICE variance can be explained by ROE; EPS can explain 18.4% by ICE; Tobin's Q can explain 20.1% by ICE; ROE could explain only 6.9% by CCE; EPS can explain 10.7% by CEE, and Tobin's Q can explain 17.56% by CEE.

V. Conclusion

Based on the analyses that have been carried out, the conclusions are obtained as follows:

1. The efficiency of intellectual capital (ICE) as the VAIC component has a positive and significantly affects the firm value and company performance at different levels of correlation and explanation.
2. The results show that VAICTM has a positive and significant effect on a company's performance, with the highest correlation level of 0.479 and an explanation rate of 37.3%,
3. VAICTM has a positive and significant effect on firm value, with the highest correlation level of 0.412 and an explanation rate of 41.83%.
4. With segregated data, the result shows that the explanatory level in the technology and finance industry is greater than in other industries.

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