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THE EFFECT OF INTELLECTUAL PROPERTY ON THE PERFORMANCE OF NON-FINANCIAL COMPANIES IN INDONESIA WITH A MARKET VALUE APPROACH

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Abstract: The global economy is rising swiftly and transforming into a modern knowledge-based economy as it enters industrial era 4.0. These advancements have caused many businesses to rely not only on material assets, but also on intangible assets. The present economic era also makes competition between firms more intense, necessitating that companies always provide the best performance in creating value through their distinctiveness and competitive edge. Based on how the market values a company, its performance can be measured. This study attempts to determine the impact of intellectual capital on corporate performance based on market value. Utilizing the intellectual capital index, this study measures intellectual capital. The data in this study used a population of all non-financial firms listed on the Jakarta Stock Exchange as many as 579 firms with an observation period of 2016 - 2020, which were then selected as research samples of 199 samples. The hypothesis in this study was analyzed using panel data regression. The results of this study indicate that intellectual capital has a positive and significant effect on company performance based on the market value approach. This implies that knowledge regarding how companies manage their intellectual capital can affect market prices. This research enables nonfinancial organizations to pay greater attention to intellectual capital, which is an immaterial asset that may be further developed to create value and improve performance of an organization.

Keywords: *Market to Book Value, Market to Book Value of Total Asset, Intellectual Capital, Total Asset, Debt Ratio to Total Assets*

1. Introduction

The amount of competition between businesses is increasing as we enter an era of knowledge-based economies that is rapidly developing. All businesses, without exception, are driven by the same primary goal: to reach the highest possible degree of profitability in order to outperform the competitors and win the market. Companies must have a distinct competitive advantage if they are to survive and succeed in the competitive environment (Apdillah et al., 2022). A company is said to have a competitive edge if it is able to generate a higher level of economic value than other companies in the same industry does (Widyaningdyah & Aryani, 2013).

In order to achieve this competitive edge, many businesses have shifted their focus away from tangible assets and toward intangible assets. As a consequence, intangible assets become a

valuable resource to be possessed by businesses in which intellectual capital is a critical component of their capital. Consequently, this is consistent with Penrose (2009) that there are productive assets that can be used to effectively prevent the expansion of old or new competitors such as strong patents for products, strong brand names, strong trademarks, and strong copyrights, all of which are considered to be intellectual capital.

Land, buildings, machinery, and other equipment become the primary source of capital for a company in the era of traditional or industrial-based economies, allowing it to gain a competitive edge through the acquisition of tangible assets (Stievany & Jalunggono, 2022). Intellectual property, on the other hand, is beginning to take its place in the modern or knowledge-based economy, where it can provide a competitive advantage for businesses by improving their work performance (Janošević et al., 2013). Intellectual property is becoming increasingly important in the modern or knowledge-based economy. It is also possible to assert that intellectual property is a more crucial form of capital for businesses than financial and physical capital (Chen et al., 2004).

Countries all over the world are entering the fourth industrial revolution as a result of the rapid growth of technology on a global scale (Saputra, 2021). The Fourth Industrial Revolution (Industrie 4.0) is a new reality in the present economic period; this is due to the fact that innovation and technical improvements play a significant part in the success of any firm (Ślusarczyk, 2018; Sugianti & Anwar, 2021). Consequently, it is tied to intellectual property, which is a crucial asset for a firm when it comes to enhancing its overall productivity. This phenomenon is consistent with previous research conducted by Zéghal & Maaloul (2010) and Nimtrakoon (2015), which discovered that intellectual property has a positive impact on the financial performance of companies listed on stock exchanges in the United Kingdom, Indonesia, Malaysia, the Philippines, Singapore, and Thailand, among other countries. Even so, previous study also concluded that intellectual property has no effect on the market or financial performance (Celenza & Rossi, 2014), which is in contradiction to previous research.

In this study, we expanded on the findings of a previous study (Sofian et al., 2020) who found that based on observational data on the performance of non-financial companies in Indonesia between 2013-2017, the performance of non-financial enterprises has been declining. In this context, determining how intellectual property influences the success of enterprises in Indonesia becomes a significant challenge.

The aim of the present current study is to identify and assess the impact of intellectual property on the performance of non-financial companies in Indonesia. This study relies on discrepancies between the findings of various previous studies. This study makes use of the Intellectual Capital Index (ICI), which was developed by McGuire and Brenner in the 1990s (McGuire & Brenner, 2015). When it comes to quantifying intellectual property, the intellectual property contribution index (ICI) can be used to determine the worth of intellectual property in relation to the entire market value (McGuire & Brenner, 2015). The measuring approach employed differs from that employed by various studies on intellectual property, which measure the value of intellectual property using the Value Added Intellectual Coefficient method was developed by Pulic (Pulic, 1998, 2000).

2. Literature Review

2.1. Intangible Asset

According to Statement of Financial Accounting Standards 19 (PSAK) (modified in 2010), intangible assets are non-monetary assets that are identified and intangible without being owned and utilized to supply or create services or goods, leased to other parties, or used for administrative purposes. As such, intangible assets have economic value or benefits, hence they can be listed as part of a firm's assets that play a role in optimizing company profitability.

Furthermore, Lisvery & Ginting (2014) concluded that in order for something to be considered an intangible asset, there are four criteria that must be met, namely:

1. The asset is identifiable and has economic value which can be exchanged or traded separately.
2. The company has control over the asset.
3. The company earns a profit based on that asset in the future.
4. The price of an intangible asset can be measured reliably.

For instance, intangible assets held by a firm might be considered resources since these assets include knowledge, company attributes, organizational procedures, competencies, and other assets that can be controlled by the organization in the process of creating economic value (Barney, 1991). This means that an organization's competitiveness in its industry is heavily determined by how effectively it controls and maximizes its resources. Additionally, resource management that is distinct and distinctive from its competitors is a method that businesses can employ to gain possibilities to maintain a competitive advantage in their respective industries at all times. Intangible property, such as intellectual property, is a resource that is contained within a company (Barney, 1991).

2.2. Intellectual Capital

Intellectual capital or intellectual property is a new concept that is not known in general or widely because it is difficult to estimate and clearly know. However, intellectual property is believed to be able to create economic value and competitive advantage for companies today or in the future (Rexhepi et al., 2013). Intellectual property also has the potential to create good value for an entity and the business or social environment (Mavridis, 2004).

Furthermore, intellectual property is all non-monetary and intangible resources partially or fully controlled by the company and contributes to the formation of the value of the company (Marr & Roos, 2005). Marr & Roos (2005) also classify intellectual property into 3 types, namely:

1. Human capital which includes creativity, education level, skills, abilities, experience, and knowledge of employees.
2. Structural capital which includes policies, strategies, culture, organizational structure, network distribution, software systems, databases, and corporate capital innovation.
3. Relationship capital which includes marketing connections, supplier relationships, customer relationships, government connections, customer loyalty, partnerships and industrial sector connections.

Complex thinking and knowledge are required to create economic value for a corporation in today's current economic period. Intellectual property is the primary source of value and performance for companies (Marr & Roos, 2005). A company's intangible assets can be leveraged to create new revenue streams for the business that owns them, according to certain intellectual property experts' definitions. This is reinforced by previous research (Sofian et al., 2020) which states that intellectual property has a positive influence on company performance. Likewise, Nimtrakoon (2015), intellectual property has a positive influence on firm performance. The company's financial performance and the company's market worth can be improved by the effective management of intellectual property owned by the company.
The following hypotheses are based on the explanation and previous research:

H1: intellectual property has a positive influence on company performance

2.3. Firm Size

Firm size is a scale that is used to categorize the size of a company (Basyaib, 2007). In order to determine the size of a corporation, total assets, total sales, stock market value, logarithm of total assets, and other factors might be considered (Machfoedz, 1994). The size of a firm, can be considered to represent the financial qualities and performance of the company. Corporations with large company sizes will have a stronger ability to obtain sources of funding for their operational and investment operations since it will be easier for them to obtain financing on the capital market. Consequently, huge corporations receive a great deal of attention, requiring that funding policies be implemented with consideration.

In order to prevent disparity against the influence of the independent variable and the dependent variable, company size was selected as the control variable (Silaban & Pengestuti, 2017). The use of firm size as a control variable is consistent with previous research (Sofian et al., 2020), and the assessment of firm size using the natural logarithm based on total assets (Dženopoljac et al., 2016; Nimtrakoon, 2015).

3. Research Method

3.1. Data and Sample Collection

This study includes secondary panel data from 2016 - 2020. The Indonesian Stock Exchange is used to collect data in the form of financial reports for each firm in Indonesia (IDX). The population of this research are all non-financial companies listed in IDX with sample selection through purposive sampling method using several criteria as follows:

1. The company has completed financial statements during the observation period
2. The company has positive equity
3. The company has intangible assets in the financial statements for at least one observation period

This study's dependent variable is the company's performance as assessed by the investment opportunity set (IOS), which is the relationship between the value of return (return) and corporate expenses in order to generate investment decisions that build company value (Hasnawati, 2005)."Company performance is measured based on the market value of the company using market to book value (MBV) as a proxy for the investment opportunity set (IOS) based on the price obtained from the comparison of stock market prices with book values" (Kallapur & Trombley, 2001) and "market to book value of assets (MBVA) as a proxy for

Tobin's Q and also a proxy for IOS based on price by dividing the sum of the market value of equity" (Lenox et al., 2010).

The independent variable of this research is intellectual property or intellectual capital. To measure intellectual property using the intellectual capital index based on McGuire & Brenner (2015) which states that "the intellectual property index is obtained by adding up all intangible assets, goodwill, and the difference between the value of the company and the book value of the company and then divided by the value of the company". Furthermore, to control the relationship between the dependent variable and the independent variable, a control variable is used where the variable is thought to have an influence on the independent variable used (Retno & Priantinah, 2012). The control variables of this study are the size of the company based on the natural logarithm of the total assets with decimal units (Panjaitan & Dewinta, 2012) and debt to total asset ratio (DAR) through the measurement of total debt divided by total assets (Kasmir, 2015; Prasetyo, 2022).

Thus, the basic model to see the influence of intellectual property on company performance based on market value is analyzed as follows:

$$MBV_{it} = \alpha + ß1ICI_{it} + ß2SIZE_{it} + ß3DAR_{it} + \varepsilon_{it} \ldots\ldots\ldots\ldots\ldots\ldots(1)$$

$$MBVA_{it} = = \alpha + ß1ICI_{it} + ß2SIZE_{it} + ß3DAR_{it} + \varepsilon_{it} \ldots\ldots\ldots\ldots\ldots(2)$$

Where: MBV is market value based on book value of equity; MBVA is market value based on total assets; ICI is an intellectual property index; SIZE is the size of the company based on the natural logarithm of total assets; DAR is a debt to total asset ratio; i is a subscript for each company; and t is the subscript for the observation period.

The descriptions of research variables are described in the following table.

Table 1. Research Variables

Dependent Variable			
Variable	**Definition**	**Equation**	**Source**
MBV	Investment opportunity set (IOS) proxy can be used as a ratio that reflects a company's capital based on market assessments of the return on investment made by the company	$\frac{Market\ Value\ of\ Equity}{Book\ Value\ of\ Equity}$	Kallapur & Trombley (2001)

MBVA	MBVA is one of Tobin's Q proxies for measuring the growth prospects of a company based on the use of assets by the company, so that the market value of the company reflects the cash flows generated by the assets invested by the company, both tangible and intangible.	$\frac{Market\ value\ equity + total\ debt}{Total\ Asset}$	Lenox et al (2010)

Independent Variable

Variable	Definition	Equation	Source
ICI	Intellectual property measurement based on intellectual property value relative to total market value	$\frac{Intangible\ asset + Goodwill + (Enterprise\ Value - Book\ Value)}{Enterprise\ Value}$	McGuire & Brenner (2015)

Control Variable

SIZE	Company size based on total company assets	Ln (Total Assets)	(Panjaitan & Dewinta, 2012)
DAR	Debt ratio to measure the ratio between total debt and total company assets	$\frac{Total\ Debt}{Total\ Asset}$	Kasmir (2015)

3.2. Panel Data Regression Model

This study uses a research sample in the form of panel data which can be said to be a combination of time series data or time series and cross-company data or cross sections (Basuki, 2016). In conducting panel data regression through three approaches, namely (Widarjono, 2007):

1. CEM (Common Effect Model)

The combination model of time series and cross section data is the simplest and does not pay attention to personal and time dimensions. In this model, companies are assumed to have the same behaviour data in various periods. The estimation of this model uses the OLS (Ordinary Least Square) approach using the following model (Widarjono, 2007):

$$Y_{it} = \alpha + \beta' X'_{it} + \varepsilon_{it} \quad \ldots\ldots\ldots\ldots\ldots\ldots (3)$$

Description:

Y_{it} : the dependent variable of the i-th cross section unit for the t-period
α : constant or unit cross section intercept
X_{it} : $[X1_{it}, X2_{it}, \ldots, Xk_{it}]$ independent variable of size (1 xk)
β : $[\beta 1, \beta 2, \ldots, \beta k]$ regression coefficient of k independent variables
ε_{it} : error term unit cross section of -i for period of -t ; $\varepsilon_{it} \sim N(0, \sigma_e^2)$

2. FEM (Fixed Effect Model)

This model is carried out by accommodating differences between cross-sectional units with differences in intercepts, but still assumes that the slope coefficient has a constant nature (Gujarati, 2021). In this model it can be done with Least Square Dummy Variables (LSDV) and weighting or Generalized Least Square (GLS). The FEM model is stated as follows (Hsiao, 2022):

$$Y_{it} = \alpha_i + \beta' X'_{it} + \varepsilon_{it} \text{ .....(4)}$$

Description:

Y_{it} : the dependent variable of the i-th cross section unit for the t-period
α_i : constant or intercept of the i-th cross section unit
X_{it} : $[X1_{it}, X2_{it}, \dots, Xk_{it}]$ independent variable of size (1 xk)
β : $[\beta 1, \beta 2, \dots, \beta k]$ regression coefficient of k independent variables
ε_{it} : error term unit cross section of -i for period t- ; it ~N(0,) σ_e^2

3. REM (Random Effect Model)

This model accommodates differences in intercepts with the error terms of each cross section unit so that this model can overcome problems that can be caused by the fixed effect model (FEM) approach. Where the REM model, differences in object characteristics and time are involved in the error term of the model (Jacob et al., 2014). In the REM model, i = 0 + i; where i is a random error or also called a latent variable which has an average of 0 and σ_e^2. variance. The equation of the REM model can be stated as follows (Gujarati, 2004):

$$Y_{it} = 0 + ' X'it + wit \text{ .....(5)}$$

where $w_{it} = \varepsilon_i + u_{it}$; $w_{it} \sim N_{iid}$ $(0, \sigma_w^2)$. The value of wit contains the error term in the data cross section (εi) and time series (uit) with the assumption that independently and identically distributed are normal with mean 0 and σ_e^2 variance (Gujarati, 2004).

3.3. Panel Data Regression Model Selection

In managing panel data, it is necessary to select the right model by carrying out several tests as follows (Basuki, 2016):

1. Chow test

Aims to determine the right model between CEM and FEM by comparing the cross section of F p-value with a critical value of alpha 0,05. If the value of the cross section of F p-value > the critical value of alpha 0,05, so that the null hypothesis is accepted, and conversely. The hypotheses for the Chow test are:

H1 = fixed effect model
H0 = common effect model

If the CEM model is selected, then the Chow Test continues with the Lagrange Multiplier Test. However, if the FEM model is selected, then the test continues with the Hausman test.

2. Hausman test

The aim is to determine the correct model between the fixed effect model and the random effect model that compares the p-value with a critical value of alpha 0.05. If the p-value > the critical value of alpha 0.05 so the null hypothesis is accepted and vice versa. The hypotheses for the Hausman test are:
H1 = fixed effect model
H0 = random effect model

If the FEM model is selected, then the test has been completed. However, if the REM model is selected, then the test is continued to the Lagrange Multiplier Test.

3. Lagrange Multiplier Test

Aims to determine the right model between the common effect model and the random effect model by comparing the Breusch-Pagan p-value with a critical value of alpha 0.05. If the Breusch-Pagan p-value > the critical value of alpha 0.05, then the null hypothesis is accepted and vice versa. The hypothesis for the Lagrange Multiplier Test is:
H1 = random effect model
H0 = common effect model

The final result of the model selection from the Lagrange Multiplier Test is the best final model to use.

3.4. Panel Data Classic Assumption Test

According to Basuki (2016) "the classical assumption test used in linear regression with the ordinary least squared (OLS) approach consists of the Linearity Test, Autocorrelation Test, Multicollinearity Test, Heteroscedasticity Test, and Normality Test". In panel data regression not all tests have to be done, the reasons are:

1. The model has been assumed to be linear so that the Linearity Test does not need to be carried out.
2. Autocorrelation problems will only occur in time series data, so the Autocorrelation Test on data other than time series will not have a significant meaning.
3. In the terms of the Best Linear Unbiased Estimator, there is no normality test in it, so that according to the experts, there is no need for a normality test for panel data testing.

In accordance with some of the explanations above, the conclusion is that the classical assumption test for the panel data regression model only needs to be tested for Multicollinearity and Heteroscedasticity Test. The Multicollinearity Test and Heteroscedasticity Test according to Basuki (2016) are explained as follows:

1. Multicollinearity Test

This test aims to see the correlation between the independent variables in the linear regression model. If the independent variables have a high correlation between the independent variables, it can cause interference with the relationship between the independent variables and the dependent variable, so that it causes multicollinearity problems. Multicollinearity test by looking at the correlation value between variables is greater than or less than 0,80. If the correlation value between variables < 0.80, it means that there is no multicollinearity problem.

2. Heteroscedasticity Test

This test aims to see whether there is a similarity in the variance of the residuals between observations or it is called homoscedasticity. Conversely, if there is no similarity in the variance

of the residuals between observations, it can be said that the model has heteroscedasticity problems.

Several methods for heteroscedasticity test are using the White Test, Glejser Test, Breusch-Pagan-Godfrey, Harvey and ARCH. Based on this test, if the p-value > alpha value of 0.05, it means that the model is free from heteroscedasticity problems (Winarno, 2011).

4. Results and Discussion

4.1. Descriptive Analysis

The goal of this research is to determine the impact of intellectual property on the performance of a firm measured by its market value.

Table 2. Sample selection criteria

Criteria	Total
Population: Non-financial companies listed on IDX during the period 2016 - 2020	579
Companies that do not meet the sample selection criteria:	
1. The company has completed financial statements during the observation period	94
2. The company that has positive equity value	28
3. The company that has intangible assets at least one during the observation period	258
The company that met sample criteria	199
Observation Period	5
Total Sample	995

Meanwhile, the minimum, maximum, mean, and standard deviation values for each of the variables in this study can be seen in the following Table (Table 3). The measurement of the company's financial performance variable based on market value uses MBV and MBVA with the lowest MBV value for the company PT. Star Pacific Tbk (LPLI) which is engaged in the trade, services, and investment services sector is 0.113881 and the lowest MBVA value for the company is PT. Sat Nusapersada Tbk (PTSN) in the various industries sector is 0.095587, while the MBV value and the highest MBVA value are each owned by PT. Unilever Indonesia Tbk (UNVR) in the consumer goods industry sector of 82,44443 and 22,74186, the highest average scores for MBV and MBVA are owned by PT. Unilever Indonesia Tbk which taken into account for 61.950762 and 17.447717, and the mean value of the MBV and MBVA variables as a whole in this observation were 2.285207 and 1.377095, respectively, with a standard deviation of 5.145695 and 1.803252. This shows that the MBV and MBVA variables have very varied data because they have a standard deviation value greater than the average market value of the company. The average MBV value shows that the market value of equity is 228.52% of the book value of equity and the average MBVA value shows that the total debt with market value of equity is 137.70% of the company's total assets.

Furthermore, intellectual property variable as measured by ICI has the lowest value of -20,07426 owned by PT. Multi Prima Sejahtera Tbk (LPIN) which is engaged in various industrial sectors, while the highest score is 12,74153 owned by PT. Sat Nusapersada Tbk

(PTSN), the highest mean score of 3.149903 owned by PT. Star Pacific Tbk (LPLI), and the overall mean value of the ICI variable is 0.392089 with a standard deviation of 1.112857. The mean of ICI value shows that the average value of the company's intellectual property in this observation is only 39.2% of the enterprise value.

The control variable SIZE as the natural logarithm of total assets has the lowest value of 11.13204 which is owned by PT. Pembangunan Graha Lestari Indah that engaged in the trade service investment sector with total assets of Rp. 68.326 million in 2016, while the highest value of 19.67902 is owned by PT. Astra International, which is engaged in various industrial sectors with total assets of Rp. 352,000,000 million in 2019, the highest average value of 19.57300 is also owned by PT. Astra International with an average total asset of Rp. 318,511,400 million, and the overall mean value of the SIZE variable is 15,36706 with a standard deviation of 1.540312. The mean value of the SIZE variable shows the mean value of the total assets of non-financial companies observed in this study of Rp. 15,203,756 million.

The control variable DAR has the lowest value of 0.000000 owned by several companies, the highest value of 0.845649 is owned by PT. Jaya Agra Wattie Tbk (JAWA) which is engaged in the agricultural sector, the highest mean value for the DAR variable is 0.758283 which is owned by PT. Tower Bersama Infrastructure, and the overall mean value of DAR variable is 0.265040 with a standard deviation of 0.190013. Based on the mean value of the DAR ratio, it shows that the company generally uses 26.5% debt to finance the company's assets.

Table 3. Descriptive statistics

	Observation	Mean	Std. Dev	Min	Max
MBV	995	2.285207	5.145695	0.113881	82.44443
MBVA	995	1.377095	1.803252	0.095587	22.74186
ICI	995	0.392089	1.112857	-20.07426	12.74153
SIZE	995	15.36706	1.540312	11.13204	19.67902
SIZE (in Million Rp)	995	15,203,756	33,496,488	68,325.90	352,000,000
DAR	995	0.265040	0.190013	0.000000	0.845649

4.2. Panel Data Regression Model Estimation

1. CEM (Common Effect Model)

As shown in Table 4, the result of the estimation of the influence of intellectual property on the performance of non-financial companies based on the market value ratio of MBV and MBVA with the CEM panel data regression model can be seen.

Table 4. Common effect models

Dependent Variable: MBV				Dependent Variable: MBVA			
Variable	**Coefficient**	**t-Statistics**	**Prob.**	**Variable**	**Coefficient**	**t-Statistics**	**Prob.**
ICI	0.671268	4.482078	0.0000	ICI	0.335897	6.563879	0.0000
SIZE	0.123082	1.146065	0.2520	SIZE	0.062428	1.701227	0.0892
DAR	-2.711147	-3.069563	0.0022	DAR	-2.134863	-7.073985	0.0000
R^2			0.026112	R^2			0.074146
Adj R^2			0.023164	Adj R^2			0.071343
Prob(F-statistics)			0.000009	Prob (F-statistics)			0.000000

Durbin-Watson	0.265638	Durbin-Watson	0.255252

2. FEM (Fixed Effect Model)

According to Table 5, the result of the estimation of the influence of intellectual property on the performance of non-financial companies based on the market value ratio of MBV and MBVA with the FEM panel data regression model with weighted or Generalized Least Square (GLS) can be seen.

Table 5. Fixed effects model

Dependent Variable: MBV				**Dependent Variable: MBVA**			
Variable	**Coefficient**	**t-Statistics**	**Prob.**	**Variable**	**Coefficient**	**t-Statistics**	**Prob.**
ICI	0.115371	7.461981	0.0000	ICI	0.071876	6.521123	0.0000
SIZE	-0.821163	-23.02763	0.0000	SIZE	-0.412953	-19.52033	0.0000
DAR	1.642673	12.49317	0.0000	DAR	0.269855	4.321913	0.0000
R^2			0.939264	R^2			0.939264
Adj R^2			0.923870	Adj R^2			0.923870
Prob(F-statistics)			0.000000	Prob (F-statistics)			0.000000
Durbin-Watson			1.723726	Durbin-Watson			1.723726

3. REM (Random Effect Model)

The result of the estimation of the influence of intellectual property on the performance of non-financial companies based on the market value ratio of MBV and MBVA using the REM panel data regression model can be seen in the following Table.

Table 6. Random effects models

Dependent Variable: MBV				**Dependent Variable: MBVA**			
Variable	**Coefficient**	**t-Statistics**	**Prob.**	**Variable**	**Coefficient**	**t-Statistics**	**Prob.**
ICI	0.128587	1.947830	0.0517	ICI	0.081133	2.976423	0.0030
SIZE	-0.200843	-1.084688	0.2783	SIZE	-0.061997	-0.952689	0.3410
DAR	1.007832	1.328054	0.1845	DAR	-0.761269	-2.52706	0.0117
R^2			0.006812	R^2			0.015126
Adj R^2			0.003805	Adj R^2			0.012144
Prob(F-statistic)			0.079363	Prob(F-statistics)			0.001724
Durbin-Watson			2.077892	Durbin-Watson			1.193820

4.3. Panel Data Regression Model Determination

1. Chow Test

This test aims to determine the best model between the common effect model (CEM) and fixed effect model (FEM). According to the test results in Table 7, the p-values for the two dependent variables MBV and MBVA show the figure of 0.000 and < 0.05 alpha value, so H0 cannot be accepted. Hence, based on these tests it was decided that the best estimation model was the FEM model.

Table 7. Chow test

	MBV		MBVA	
	Statistics	**Prob**	**Statistics**	**Prob**
Cross-section F	39.514532	0.0000	25.461700	0.0000
Cross-section Chi-square	2373.726544	0.0000	1985.727815	0.0000

2. Hausman test

This test aims to determine the best model between the fixed effect model and the random effect model. Based on Table 8, the p-value for the MBV variable shows the figure of 0.0005 and the p-value for the MBVA variable which shows 0.0000. Both p-values shows the figure of < alpha value (0,05), so they cannot accept H0. Therefore, based on these tests it was decided that the best estimation model was the FEM model.

Table 8. Hausman test

	MBV		MBVA	
	Statistics	**Statistics**	**Prob**	**Prob**
Random cross-section	17.937048	35.330896	0.0000	0.0005

4.4. Classic Assumption Test

1. Autocorrelation test

Autocorrelation test by comparing the Durbin-Watson value (dW statistic) in the fixed effect model (FEM) with the dU and dL values in the Durbin-Watson table. From the estimation results, the dW statistic value is 1.723726 for the equation with MBV as the dependent variable and based on the number of independent variables (k) the values for dL are 1.89206, dU 1.90008, 4 – dU 2.09992, and 4 – dL 2.10794. The value of the dW statistic is in the position dW < dL < dU < 4 – dU < 4 – dL, so that the position of dW is in a positive autocorrelation.

For the equation with MBVA as the dependent variable, the dW statistic value is 1.648757, dL is 1.89206, dU 1.90008, 4 – dU 2.09992, and 4 – dL 2.10794. The value of the dW statistic is in the position dW < dL < dU < 4 – dU < 4 – dL, so that the position of dW is in a positive autocorrelation.

Gujarati & Porter (2004) suggest that “the General Least Square (GLS) method can suppress autocorrelation problems that usually arise in equations with the Ordinary Least Square (OLS) method as a result of the variance estimation error”. Thus, using the GLS method, the autocorrelation problem can be solved. Estimation using the GLS method can ignore the occurrence of autocorrelation problems in panel data because basically the data have the same characteristics (Iqbal, 2015). This is supported by Basuki (2016) that "the autocorrelation problem that occurs in data that is not time series has no significant meaning".

2. Multicollinearity test

The correlation analysis in this study can be seen in Table 9. The table shows that the correlation between ICI and SIZE is 0.152176 and the correlation between ICI and DAR is 0.225702. The correlation between SIZE and DAR is 0.191254. From the results of the correlation test between ICI, SIZE, and DAR, it shows that there is no multicollinearity problem because each correlation shows a value of less than 0.80.

Table 9. Correlation analysis

	ICI	SIZE	DAR
ICI	1.0000000	0.152176	0.225702
SIZE		1.0000000	0.191254
DAR			1.0000000

3. Heteroscedasticity test

The classical assumption of heteroscedasticity testing using the Glejser method which regresses the absolute value of the residuals on the independent variables and the control variables are estimated to have the same variance of the residuals generated between observations which can be seen in Table 10 (Ghozali, 2011). The table shows that the p-value for the independent variable is 0.8518 and the p-value for the control variable is 0.1022 and 0.2039. Based on these results, the p-value for the three variables > 0.05 alpha values, these results indicate that data is free from heteroscedasticity problems or the residuals from each observation have the same variance.

Table 10. Heteroscedasticity test

Variable	Coefficient	Std. Error	t-Statistics	p-value
C	5.199762	2.87079	1.811265	0.0705
ICI	0.007389	0.039528	0.186943	0.8518
SIZE	-0.310229	0.189614	-1.636103	0.1022
DAR	0.637449	0.501383	1.271482	0.2039

4.5. Discussion

According to Table 11, it shows the effect of intellectual property as measured by ICI on company performance based on market value as measured by MBV. Based on the t-test in the Table 11, it is known that intellectual property has a positive effect on MBV. This can be seen from the t-Statistic table which shows significant results at the critical levels of 1%, 5%, and 10%. The results of this study are in line with the previous research who found that intellectual property has a positive influence on financial and market performance (Nimtrakoon, 2015; Sofian et al., 2020)

The findings of this study indicate that intangible assets such as innovation, efficiency, and effectiveness in a business process can increase the company's value in the market, so that intellectual property becomes an important asset for companies to pay attention to.

Further, the influence of intellectual property on company performance based on market value as measured by MBVA can be seen in Table 12. Based on the t-test in Table 12, it is known that intellectual property has a positive effect on MBVA. This can be seen from the t-Statistic table which shows significant results at the critical levels of 1%, 5%, and 10%. This study also found similar results with previous analysis who found intellectual property positively affects market performance (Hejazi et al., 2016) as well as intellectual property that positively affects market performance and company financial performance (Sofian et al., 2020).

The findings of this study indicate that intellectual property which is included in intangible assets has an influence in increasing the value of the company in the market where the measurement is based on the proxy of the investment opportunity set based on price and the Tobin's Q proxy which looks at the sum of the market value of equity and total debt divided by with total assets. The rise in the market value of a company caused by intellectual property

owned by the company occurs because investors use information on the total assets of the company in obtaining returns, so that the higher the ownership of assets and the use of the company to run its business, the greater the possibility for the company to grow.

Table 11. Regression of 1st equation: the influence of intellectual property on market performance (MBV)

Variable	Coefficient	*t-Statistics*
1st Equation (Fixed Effect)		
ICI	0.115371	7.461981*
SIZE	-0.821163	-23.02763*
DAR	1.642673	12.49317*

*: *Significance at 1%, 5%, and 10% level*

Table 12. Regression of 2nd equation: the influence of intellectual property on market performance (MBVA)

Variable	Coefficient	*t-Statistics*
2nd Equation (Fixed Effect)		
ICI	0.071876	6.521123*
SIZE	-0.412953	-19.52033*
DAR	0.269855	4.321913*

*: *Significance at 1%, 5%, and 10% level*

Consequently, the findings show that intellectual property has a positive influence on MBV and MBVA, and the study provides sufficient evidence to conclude that the hypothesis tested is reasonable.

Today's knowledge-based economy necessitates the need for companies to pay greater attention to the existence of intellectual property, which is included in the category of intangible assets. Intellectual property, in addition to playing a crucial function, can also be a competitive advantage for a company. This is because intellectual property is a valuable asset that can have an impact on a company's market valuation. To encourage employees to be more creative and always strive for improvement, it is essential for top management of a company to be able to make better use of company finances by allocating funding for intangible assets such as research and development needs, software systems, databases, and so on to create fresh ideas and breakthroughs that will help the company growth.

5. Conclusion

The results of the data processing and discussion described above lead to the conclusion that intellectual property has a positive influence on market assessment of a company. As a consequence, as the global business era has progressed, intellectual property has evolved into an asset that plays a vital role in the creation of value and competitive advantage for companies in the business.

In this study, intellectual capital is measured using the intellectual capital index (ICI), which measures intangible assets, goodwill, book value, and enterprise value. This is distinct from intellectual property research in general, which utilizes VAIC with Value Added Capital (VAHU), Value Added Capital Coefficient (VACA), and Value-Added Structural Capital

(STVA) as measurements. Therefore, the empirical result of this research is to propose a novel strategy for enhancing the market evaluation of a company by fostering innovation, uniqueness, and company knowledge.

Given that this study only considers market value when evaluating company performance, suggestions for further research could concentrate on evaluating company performance solely on the basis of financial performance, as well as comparing the impact of intellectual property on company performance in developed and developing countries.

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