www.cya.unam.mx/index.php/cya

Contaduría y Administración
Accounting & Management

Contaduría y Administración 70 (4), 2025, e521

Analyzing the connection between management skill, intangible asset, intellectual capital, and firm performance; An empirical study in Indonesia

Análisis de la relación entre las habilidades de gestión, los activos intangibles, el capital intelectual y el desempeño de la empresa; un estudio empírico en Indonesia

Variyetmi Wira[1], Niki Lukviarman[2]*, Rida Rahim[2], Efa Yonnedi[2]

[1]Politeknik Negeri Padang, Indonesia
[2]Universitas Andalas, Indonesia

Received October 3, 2023; accepted August 26, 2024
Available online June 4, 2025

Abstract

This research investigates the relationship between management skills, intangible assets, intellectual capital, and company performance in Indonesia. Indonesia needs its resources to function as a corporation and provide competitive advantages for companies because it is a developing country. These resources include management capabilities, intangible assets, and intellectual capital. Therefore, the methods ROA, ROE, and NPM are used in this research to measure the company's success. Based on panel data analysis, managerial ability dramatically influences the increase in ROA. Further research reveals that management talent and intellectual capacity significantly impact NPM. This finding is slightly different from previous research, which showed the negative impact of intellectual capital on NPM. That suggests that managers in Indonesia should do this in order to develop.

JEL Code: O16, O53, L25
Keywords: firm performance; intellectual capital; intangible asset; managerial ability

*Corresponding author.
E-mail address: ridarahim@eb.unand.ac.id (N. Lukviarman).
Peer Review under the responsibility of Universidad Nacional Autónoma de México.

http://dx.doi.org/10.22201/fca.24488410e.2025.5233

Resumen

Esta investigación investiga la relación entre las habilidades de gestión, los activos intangibles, el capital intelectual y el desempeño de las empresas en Indonesia. Indonesia necesita sus recursos para funcionar como una corporación y brindar ventajas competitivas a las empresas porque es un país en desarrollo. Estos recursos incluyen capacidades de gestión, activos intangibles y capital intelectual. Por lo tanto, en esta investigación se utilizan los métodos ROA, ROE y NPM para medir el éxito de la empresa. Según el análisis de datos de panel, la capacidad de gestión influye drásticamente en el aumento del ROA. Investigaciones adicionales revelan que el talento gerencial y la capacidad intelectual impactan significativamente en la NGP. Este hallazgo es ligeramente diferente de investigaciones anteriores, que mostraron el impacto negativo del capital intelectual en la NGP. Esto sugiere que los directivos en Indonesia deberían hacer esto para poder desarrollarse.

Código JEL: O16, O53, L25
Palabras clave: desempeño firme; capital intelectual; activo intangible; capacidad gerencial

Introduction

The goal of a company is to enhance shareholder welfare (Moreno & Petrakis, 2022) by increasing corporate profits through achieving sustainable firm performance. All company activities are recorded in financial reports, which stakeholders use to evaluate the company's performance periodically and continuously. Several steps can be taken to prevent competitors from imitating their resources to create a competitive advantage: (1) recruiting knowledgeable managers strategically placed within the company. These managers should engage in careful, systematic study, enabling them to provide innovation and performance that supports the company's sustained success. (2) A complex social phenomenon includes interpersonal relationships among managers, the company's culture, and its reputation among suppliers and customers (Porter, 1991).

The existing literature points out that the Internet of Things and Services development in various business activities has laid the foundation for the next industrial revolution, known as Industry 4.0 (Chen, 2021). The Resource-Based View theory (RBV) enables maximum control of internal resources through strategies that utilize assets impacting competitive advantage (Barney, 1991; Barney, 1986, 2001). This theory highlights that a company's ability to sustain its business is measured by its annual performance. A company's perspective on resource management and innovation significantly enhances its performance. Every company possesses internal capabilities that refer to skills in transforming inputs into outputs to achieve positive performance (Rajapathirana & Hui, 2018; Salim et al., 2019).

In recent years, Indonesia has seen significant economic and technological advancements, influencing managerial ability, intellectual capital, and intangible assets (Soetanto & Liem, 2019; Widnyana et al., 2021). The government's "Making Indonesia 4.0" initiative aims to position the country among the top 10 global economies by 2030 through industrial modernization and digital transformation,

encouraging businesses to adopt advanced technologies (Prakosa et al., 2024). Economic reforms and infrastructure investments have contributed to robust economic growth, fostering a competitive business landscape (Lindblad, 2015). Additionally, the burgeoning digital economy, projected to reach USD 133 billion by 2025 (Coordinating Ministry for Economic Affairs, 2020), highlights the importance of digital skills and intellectual property, prompting companies to invest in digital platforms and technologies, which impact managerial strategies and performance outcomes.

With technology advancements as a basis, knowledge becomes a source of company growth and competitive advantage. This concept pertains to wealth creation associated with developing and maintaining intangible resources for competitiveness (Bayraktaroglu et al., 2019; Sardo & Serrasqueiro, 2018; Soewarno & Tjahjadi, 2020). Intellectual Capital (IC) generally comprises a range of knowledge that can be transformed into company value (Gupta & Raman, 2021; Vo & Tran, 2021). Intellectual capital is not represented on traditional balance sheets as monetary or physical assets, making it challenging to identify, capture, and report in financial statements. Academic studies often divide intellectual capital into two to four dimensions of intangible assets (Vo & Tran, 2021). Different models are proposed to measure intellectual capital in various fields, such as accounting, economics, finance, human resources, psychology, and strategy.

Investment in intangible assets plays a strategic role in achieving sustained competitive advantage, specifically by investing in intangible assets (Salehi et al., 2022; Weqar & Haque, 2020). A company's strategy heavily influences the development of investment in intangible assets to achieve optimal performance and competitive advantage. Intangible assets are non-monetary, identifiable assets without physical form (Widnyana et al., 2021) and are included in company financial reports (IFRS-based PSAK). Intangible assets can be identified based on two criteria: separable resources, which can be sold, transferred, licensed, leased, or exchanged, and resources arising from contractual or legal rights by assessing contract values.

Achieving competitive advantage requires competitive managerial abilities, which are essential for generating company efficiency. Total company efficiency, influenced by company size, market share, cash availability, life cycle, operational complexity, and foreign operations, depends significantly on managerial ability. This ability primarily stems from managers' knowledge of the market, company plans, and technology (Rajabalizadeh & Oradi, 2022). Capable managers, with a better understanding of technological and market dynamics, can accurately predict market trends, invest in profitable projects, and manage employees effectively (Demerjian et al., 2011). High-ability managers obtain accurate investment information, enabling informed investment decisions.

Intangible resources have been thoroughly investigated in prior studies based on several theories, including RBV and stakeholder theory. The variables used in this research are intellectual capital, intangible assets, and managerial ability. Due to the diverse results of the used variables, this study is the

first to explore intangible resources grounded in the RBV theory. These resources are expected to bridge the gap for companies in creating competitive advantages measured by company performance.

The strategy for creating competitive advantage can be implemented by investing in intellectual capital, intangible assets, and managerial ability. The results of this research are expected to provide insight to companies in creating competitive advantages measured by company performance. The research objective is to test the relationship between intellectual capital, intangible assets, managerial ability, and firm performance in public companies in Indonesia.

Literature review

Intellectual capital

Intellectual capital refers to the knowledge, experience, and intellectual property that contribute to a company's competitive advantage (Yaseen et al., 2016). It includes human capital (skills and expertise of employees), structural capital (processes, patents, and databases), and relational capital (relationships with customers and suppliers). Intellectual capital is a subset of intangible assets, which are non-monetary, identifiable assets without physical substance (Lentjušenkova & Lapina, 2016). Intangible assets encompass intellectual capital as well as other assets such as trademarks, brand recognition, and proprietary technologies.

Considering the increasing importance of intellectual capital in value creation, Pulic (1998) developed a method for measuring Intellectual Capital known as the Value-Added Intellectual Coefficient (VAIC). This method enables the measurement of the contribution of each resource, including human, structural, physical, and financial resources, in creating Value Added (VA) by the company. VAICE is considered the most suitable method for measuring IC, as Chan (2009) asserted, who found that VAICE is convincing as a tool for measuring IC and contributes significantly to practical and empirical insights..

In the VAIC literature, some studies have expanded the approach by incorporating additional IC components beyond those considered by Pulic's methodology. Nazari & Herremans (2007) introduced customer, renewal, and process capital as substitutes for structural capital, enhancing understanding of IC's role in company performance. This study employed marketing expenses as a proxy for customer capital and R&D costs for renewal capital (InC). Process capital (PC) differs between structural capital (SC) and the total customer and renewal capital. In this context, SC was the sum of all three sub-components, and SC efficiency (SCE) was calculated as a proportion of VA.

The RBV theory, which emphasizes leveraging internal resources to achieve competitive advantage (Barney, 2001), provides a foundational framework for understanding how intellectual capital contributes to firm performance. Integrating RBV with Industry 4.0, which focuses on the integration of digital technologies into

business processes, highlights how companies can enhance their intellectual capital through technological advancements (Bazan & Estevez, 2022). This integration is particularly relevant for Indonesian companies, which are increasingly adopting Industry 4.0 technologies to improve efficiency and competitiveness in a rapidly evolving market.

Intangible assets

According to PSAK No. 19 (Revised 2010), intangible assets are non-monetary assets that can be identified without physical substance (Widnyana et al., 2021). That is further emphasized by the International Accounting Standards Board (IASB), which recognizes intangible assets as non-monetary resources identifiable without physical substance.

The results of the OECD study in 2011, as revealed by Kedron (2020) and Seo & Kim (2020), classified intangible items into three types: computer information (software and databases), innovation property (scientific and non-scientific R&D, copyrights, projects), and economic competencies (embedded knowledge in human capital and particular company branding such as trademarks, company human capital, business communication systems, organizational knowledge enhancing business efficiency, advertising and marketing aspects).

Investment in intangible assets is growing globally. In some cases, these investments are equivalent to or exceed investments in traditional tangible assets such as buildings, equipment, and machinery (OECD, 2011). For Indonesian companies, the strategic investment in intangible assets, aligned with the principles of Industry 4.0, can drive innovation and enhance competitive advantage by leveraging digital technologies and intellectual capital.

Managerial ability

The research literature has studied managerial ability regarding how managerial personal characteristics, through proxies of managerial ability, affect the quality of financial reporting and forecasting of companies (Yan & Thewissen, 2021). High-ability managers are better at understanding technology and industry trends, predicting product demand reliably, investing in higher-value projects, and managing their employees more efficiently than low-ability managers (Putra et al., 2021; Simamora, 2022). Several studies document varied results, showing no relationship or correlation between managerial ability, company operations, and financial performance, even influencing stock prices (Chen & Chen, 2020).

The primary measure of managerial ability, the MA-Score, was developed by Demerjian et al. (2013), estimating how efficiently managers use company resources. As a result, the measured resources consider both tangible and intangible assets, innovative capital (R&D), and other inputs such as labor and

consulting services that are not reported separately in financial statements but whose costs are included in sales and SG&A expenses.

The RBV theory underscores the importance of managerial ability as a critical internal resource (Kauppila, 2015). High-ability managers can maximize the use of intangible assets and intellectual capital, particularly in the context of Industry 4.0, where technological acumen and strategic resource management are crucial for sustaining competitive advantage in the Indonesian market.

Hypotheses

Intellectual capital and firm performance

Evaluation techniques for estimating a company's Intellectual Capital (IC) and strategic management tools for managing and developing IC have received considerable attention. Empirical findings indicate a positive relationship between IC, financial performance, and shareholder value. Besides that, different results were obtained within the research on the impact of VAIC components on financial performance, showing varied relationships with changes in financial indicators. VAIC components significantly affect productivity outcomes, with physical capital playing a primary role in productivity and profitability. Furthermore, Asset Turnover (ATO) and Return on Assets (ROA) were shown to be significantly influenced by structural capital. The relationship between intellectual capital and financial performance in construction is unique. Physical and human capital (HC) are significant contributors to company performance. Additionally, structural capital (SC), relational capital (RC), and innovation capital are the least developed elements of IC. Intellectual and physical capital correlate positively and significantly with company performance. However, human capital and structural capital negatively affect financial performance. These findings imply that the components of intellectual capital require interaction with each other to create value (Mohammad & Bujang, 2019). This research aligns with studies (Ahmed et al., 2020; Isola et al., 2020; Shahzad et al., 2022) stating that IC positively impacts company performance. While individually, some IC components yield contrasting effects. Relational capital tested in the manufacturing sector in China harms company performance, as studied by Xu et al. (2019) and Zhang et al. (2021) examined intellectual capital's impact on company performance in the textile industry in China. The findings show that physical and human capital contributes to company performance. Given the diverse results of these studies, the following hypothesis is formulated:

H1: Intellectual Capital significantly and positively affects firm performance.

Intangible asset and firm performance

Intangible assets (IA) encompass all resources that lack physical existence yet significantly contribute to a company's profitability and long-term sustainability. IA includes knowledge, information, intellectual property, and experience (Durand & Milberg, 2020; Milala et al., 2021). In this context, IA becomes a crucial resource for sustainable competitive advantage responsible for a company's market performance (Ionita & Dinu, 2021; Tahat et al., 2018).

Research findings indicate that intangible assets positively contribute to profitability and enhance company performance (Muwardi et al., 2020; Scafarto et al., 2016; Seo & Kim, 2020; Xu & Li, 2022). In addition, some studies conducted in various developing and developed countries also yield diverse results. Some research states that intangible assets positively and significantly influence firm performance (Garanina & Pavlova, 2011; Ionita & Dinu, 2021; Mohammed & Ani, 2020). Conversely, some studies report opposite (negative) results due to the need for more information available in financial reports regarding intangible assets and difficulties in defining and measuring intangible assets ((Ionita & Dinu, 2021; Morbey et al., 2017). Likewise, Haseeb et al. (2019) and Torres et al. (2018) found no statistically significant relationship between intangible assets and company performance. Given the variety of prior findings on the impact of intangible assets on company performance, this study formulates the following hypothesis:

H2: Intangible assets significantly and positively affect firm performance

Managerial ability and firm performance

Effective managers ensure the optimal utilization of scarce company resources in challenging environments with the assistance of their professional and academic knowledge. Previous research has highlighted managerial ability as one of the most crucial managerial attributes in determining the success of an organization. Managers with high ability are considered well-versed in business, industry, and product knowledge, capable of making better judgments compared to their peers, adept at efficiently managing their employees, and possess ample information about future trends and technologies (Demerjian et al., 2011; Jebran & Chen, 2022). These studies also indicate that companies with high-ability managers tend to exhibit more significant innovation, make highly efficient investment decisions, demonstrate superior organizational performance, and achieve higher-quality revenue reporting (Coudounaris et al., 2020; Jebran & Chen, 2022; Soedarmono et al., 2019).

Different results were obtained in the study by Cheng et al. (2020), which stated that the commonly used managerial ability index showed an insignificant relationship with company performance.

Research examining managerial ability's impact on firm value has also yielded varied outcomes. The study by Andreou et al. (2017) was conducted during the 2008 global crisis. Given the diverse nature of these findings, the following hypothesis is formulated:

H3: Managerial Ability significantly and positively affects firm performance

Method

Sample

The total number of public companies in the year 2022 was 810 companies listed on the Indonesia Stock Exchange (IDX). Some companies needed to provide more data within the research period, resulting in 107 companies per year being included in the study, making a total sample of 1177 companies. Data was collected using the Datastream database (Refinitiv Eikon), and data was also gathered from the website www.idx.co.id to access the financial reports of companies listed on the IDX for the observation period from 2012 to 2022.

This study acknowledges the implementation of IFRS16 in 2019 altered the recognition of leases on the balance sheet, affecting liabilities and metrics like ROA, ROE, and ROIC. To maintain the validity of the analysis, the pre-2019 metrics were recalculated as if IFRS16 had been in place. This adjustment allowed for a direct comparison across the entire period from 2012 to 2022. Additionally, a robust methodological approach was used to ensure that key financial metrics were uniformly adjusted, aligning the data before and after 2019.

Regarding the revaluation of fixed assets and equity increases, it is ensured that any revaluations using Discounted Cash Flow (DCF) methods were consistently applied. Any increases in equity due to asset revaluation were normalized across the study period, ensuring a consistent analysis. After making these adjustments, sensitivity analyses were conducted to evaluate the impact of IFRS16 and asset revaluations on our overall results. The findings indicated that the overall trends in financial performance metrics remained consistent, and the relationships between leverage and firm performance were robust. The statistical significance of the findings was also largely unaffected, supporting the reliability of the results.

Measurement of the variables

The measurement of the dependent variable used in this study is company performance. The variables employed are accounting-based company performance metrics, namely Return on Assets (ROA), Return

on Equity (ROE), and Net Profit Margin (NPM) (Rahman & Howlader, 2022; Vanacker et al., 2021). The utilization of these ratios positively correlated with the company's performance condition; when there is a positive post-tax profit, the company's performance will be considered reasonable. The approach used to measure company performance is based on Horne (2002).

$$\text{ROA} = \frac{\text{Earning after tax}}{\text{Total Asset}} \tag{1}$$

$$\text{ROE} = \frac{\text{Earning after tax}}{\text{Total Equity}} \tag{2}$$

$$\text{NPM} = \frac{\text{Earning after tax}}{\text{Sales}} \tag{3}$$

The measurement of the independent variables used in this study comprises Intellectual Capital (IC), Intangible Asset (INT), and Managerial Ability (MAN). In this study, Intellectual Capital refers to IC performance measured by the Value Added (VA) generated from several components: physical capital, human capital, relational capital, and structural capital. Combining these four components results in a formula known as the Modified Value Added Intellectual Coefficient (M-VAIC). The Modified Value Added Intellectual Coefficient (M-VAIC) is a performance measurement model for intellectual capital based on Pulic's VAIC™ measurement model (Ulum et al., 2017). In the VAIC model, the components consist of HCE, HSE, and CEE, while in MVIC, an additional component is added, namely RCE. The modified VAIC (M-VAIC) model begins with the calculation of VA as the starting point:

$$\text{VA} = \text{OP} + \text{EC} + \text{D} + \text{A} \tag{4}$$

Intangible assets are measured using the method of the representativeness of intangible assets (RIA). That represents an accounting perspective on the calculation of intangibles in the company's financial statements.

$$\text{RIA} = \frac{\text{Intangible asset}}{\text{total Asset}} \tag{5}$$

The measure of managerial ability is referred to as the MA-Score, developed by (Demerjian et al., 2013), which provides an estimate of how efficiently managers utilize the company's resources. All companies use capital, labor, and innovative assets to generate revenue. High-quality managers will produce a higher output level from the given inputs than lower-quality managers.

The measurement utilized by (Demerjian et al., 2013) employs data envelopment analysis (DEA) to assess the efficiency of companies in the industry. That involves comparing the sales generated by each company based on the inputs used, such as cost of goods sold, selling and administrative expenses, net PP&E, net operating lease expenses, net R&D costs, purchased goodwill, and other intangible assets. The following is the formula for measuring managerial ability.

$$\text{Firm efficiency} = \frac{\text{Sales}}{\text{CoGS} + \text{SG\&A} + \text{PPE} + \text{OpsLease} + \text{R\&D} + \text{Goodwill} + \text{other Intangible}} \tag{6}$$

Thus, the measured resources reflect tangible and intangible assets, innovative capital (R&D), and other inputs not separately reported in financial statements, such as labor and consulting services. However, their costs are included in the cost of sales and SG&A.

This study employs two control variables, SIZE and leverage (Lev), which may impact the dependent variable to control for the influence on firm performance. Larger companies possess sufficient resources to accommodate strategies that enhance performance. Additionally, larger companies exhibit more market power, reflecting higher firm performance, competitive advantage, and economies of scale. Therefore, this study measures company size using the natural logarithm of the company's Total Assets.

$$\text{SIZE} = \text{Ln (Total Aset)} \tag{7}$$

The second control variable is leverage, indicating that companies with high leverage (defined as a debt-to-equity ratio exceeding 2.0) impose a debt burden that may decrease firm performance. Empirical evidence supports this assertion, as studies by Tahat et al. (2018) has shown a negative correlation between high leverage and financial performance metrics such as ROA, ROE, and ROIC. However, it is important to note that certain companies, under specific conditions, manage high leverage effectively and maintain strong financial performance.

$$\text{LEV} = \frac{\text{Total Debt}}{\text{Total Equty}} \tag{8}$$

Regarding the measurements, the application of the M-VAIC model in Indonesian companies like PT Bank Central Asia Tbk (BCA) and PT Unilever Indonesia Tbk demonstrates the model's relevance and practical implications in the local context. BCA, one of Indonesia's largest private banks, showcases the practical application of M-VAIC. The bank's high M-VAIC score reflects its strategic investments in human capital (employee training), structural capital (advanced IT systems), physical capital (extensive branch network), and relational capital (strong customer relationships). On the other hand, Unilever Indonesia, a leading consumer goods company, also illustrates the use of M-VAIC. The company's investments in talent development, state-of-the-art manufacturing, extensive production facilities, and strong brand equity contribute to its high M-VAIC score.

Comparative analyses with other studies highlight the strengths and limitations of the M-VAIC model, emphasizing the need for contextual adaptation and careful consideration of methodological complexities. In European business studies, Pulic's VAIC model has been widely used, showing mixed results in its effectiveness. While some studies have found a positive link between VAIC components and firm performance, others have not. Pulic's model is appreciated for its simplicity and broad applicability across different industries and regions. However, concerns have been raised about its suitability for Indonesian companies and potential redundancy in its metrics. In contrast, Nazari & Herremans introduced an enhanced IC model, aiming for a more comprehensive understanding of intellectual capital's impact. This model offers a broader perspective on capital components but faces criticism for its complexity and data requirements.

This study employs data analysis using the panel data regression method. Panel data analysis offers several advantages. Firstly, it provides a larger dataset, increases degrees of freedom, and reduces collinearity among explanatory variables, yielding efficient econometric estimations. Secondly, it offers crucial, unattainable insights when utilizing time series and cross-sectional data alone. Another advantage of using panel data is that it provides more information, incorporates more variables, reduces collinearity among observed variables, and provides more degrees of freedom, resulting in greater efficiency.

Empirical model

This section discusses data analysis and tests the relationships between variables studied in this research. Data analysis is conducted using EViews 12.0 and Microsoft Excel 2021 software. This study employs a regression model analysis for panel data. There are two main regression models for panel data: the fixed effects model (FEM) and the random effects model (REM). In the fixed effects model (FEM), the intercept is assumed to differ among individuals, acknowledging that each unit may have distinct inherent

characteristics. In REM, the intercepts of individual units are assumed to be random, drawn from a larger population with a constant mean (Gujarati, 2003).

The analysis method involves an econometric model with hypothesis testing using multiple regression analysis. Multiple regression analysis tests the influence of MA, FINOV, SIZE, and LEV on firm performance, measured by ROA, ROE, and NPM. Hypothesis testing is employed to examine the congruence of theoretical concepts with the regression analysis results based on regression coefficients and the significance level of each firm performance variable. Hypothesis testing can be conducted simultaneously (F-test) and partially (t-test), comparing within a 5% probability scale. Before conducting hypothesis testing, the researcher performs model selection tests and tests for classical assumptions. The goal is to ensure the research model is suitable for further testing.

Research findings

This study begins with selecting the most efficient model from two-equation models: the

Fixed Effect Model (FEM) and the Random Effect Model (REM). Both models are tested within each research model used in this study.

Chow test

The Chow test is conducted to compare or select the better fit between the standard effect model and the fixed effect model. The decision is based on the probability value for the cross-section F. If the p-value is > 0.05, the chosen model is the standard effect model. However, if $p < 0.05$, the selected model is the fixed effect model. Based on the results in Table 1, it can be observed that Model 1 yields a value of 0.000 < 0.05, indicating that the preferred model to use is the Fixed Effect Model (FEM). Meanwhile, Models 2 and 3 exhibit values greater than 0.05. Thus, the Common Effect Model (CEM) is preferred for these cases. The Hausman test further follows the selection of the best model for Model 1. On the other hand, Models 2 and 3 can proceed directly to the LM test.

Table 1
Chow's Test

Effects Test	Statistic	d.f.	Prob.	Decision
Model 1				
Cross-section F	16.0680	(10,105)	0.0000	
Cross-section Chi-square	112.3282	10	0.0000	FEM
Model 2				
Cross-section F	0.833364	(10,105)	0.5976	
Cross-section Chi-square	9.241456	10	0.5094	CEM
Model 3				
Cross-section F	1.1454	(10,105)	0.3363	
Cross-section Chi-square	12.5280	10	0.2513	CEM

Hausman's test

The Hausman test chooses the most appropriate approach between the Random Effects Model (REM) and the Fixed Effects Model (FEM) in estimating panel data. The decision-making basis for the Hausman test is as follows: If the probability value for the random cross-section is greater than the significance level of 0.05, then the most suitable model to use is the Random Effects Model (REM). However, if the probability value for the random cross-section is less than the significance level of 0.05, then the Fixed Effects Model (FEM) is the most suitable model to use. Based on the data analysis results presented in Table 2, it can be observed that all models have cross-section Chi-square probability values greater than 0.05. This outcome indicates that the Random Effects Model (REM) approach is the best model choice.

Table 2
Hausman's Test

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.	Decision
Model 1				
Cross-section random	1.734702	5	0.8845	REM
Model 2				
Cross-section random	2.618037	5	0.7586	REM
Model 3				
Cross-section random	8.215325	5	0.1448	REM

LM test (Lagrange Multiplier test for random effects)

The LM test, developed by Breusch-Pagan, is used to determine whether the random effects model is superior to the expected effects model (OLS) and verify the consistency of the Fixed Effects Model's results in the previous tests. The assessment of the LM test is based on the Breusch-Pagan statistic: if the

value is < 0.05, then the preferred model approach is REM, while conversely, the chosen model approach is CEM. Based on the test results presented in Table 3, it is evident that models one will be analyzed using the REM approach, and models 2 and 3 will be analyzed using the CEM approach.

Classical assumption tests

After determining the appropriate models to use in the panel data regression equations, namely FEM and CEM, it is necessary to perform classical assumption tests. The classical assumption tests used include the tests for multicollinearity and heteroskedasticity. The multicollinearity test is conducted to ensure whether there is intercorrelation or collinearity among the independent variables within a regression model. The results of this test can be observed in Table 4.

Table 3
LM Test

	Test Hypothesis			Decision
	Cross-section	Time	Both	
Model 1				
Breusch-Pagan	167.3851	0.004234	167.3893	
	(0.0000)	(0.9481)	(0.0000)	REM
Model 2				
Breusch-Pagan	0.698628	0.159434	0.858062	
	(0.4032)	(0.6897)	(0.3543)	CEM
Model 3				
Breusch-Pagan	0.936778	1.447307	2.384084	
	(0.3331)	(0.2290)	(0.1226)	CEM

Table 4
Multicollinearity Test

	INT	LEV	MAN	IC	SIZE
INT	1.0000	-0.0832	-0.0639	-0.0862	-0.4586
LEV	-0.0832	1.0000	0.2108	-0.1474	0.0249
MAN	-0.0639	0.2108	1.0000	-0.0659	-0.0881
IC	-0.0862	-0.1474	-0.0659	1.0000	0.0252
SIZE	-0.4586	0.0249	-0.0881	0.0252	1.0000

The correlation coefficients between Intangible asset and leverage are 0.0832 < 0.85, between X1 and Managerial ability is -0.0639 < 0.85, between intellectual capital and size is -0.4585 < 0.85, between leverage and Managerial ability is 0.2108 < 0.85, between intellectual capital and size is 0.0249 < 0.85, between Managerial ability and intellectual capital is -0.0659 and size is -0.0881 < 0.85, and between intellectual capital and size is 0.0252. All coefficient values are below 0.05, indicating that the variables used in this study are free from multicollinearity.

In addition, to address concerns about multicollinearity, we also conducted a Variance Inflation Factor (VIF) analysis. The results are presented in Table 5. The VIF values for all variables are range from 1.05 to 6.45, all below the threshold of 10, suggesting that multicollinearity does not pose a significant problem in our regression models. This ensures the robustness and reliability of our findings.

Table 5
Variance Inflation Factor (VIF) Analysis

Variable	VIF
Constant	1.05
Intangible Assets (INT)	4.32
Leverage (LEV)	3.78
Management Skill (MAN)	5.12
Intellectual Capital (IC)	3.94
Firm Size (SIZE)	6.45

The second classical assumption test is the heteroskedasticity test, which aims to determine whether there is unequal variance of residuals across observations in a linear regression model. A good regression model exhibits homoskedasticity, meaning no heteroskedasticity occurs. This test on panel data uses actual fitted residuals with the residual graph shown in Figure 1. Based on the residual graph (in blue), it can be observed that the line does not cross the boundaries (500 and -500), indicating equal residual variances. Therefore, the research model suggests the absence of heteroskedasticity symptoms or passing the heteroskedasticity test.

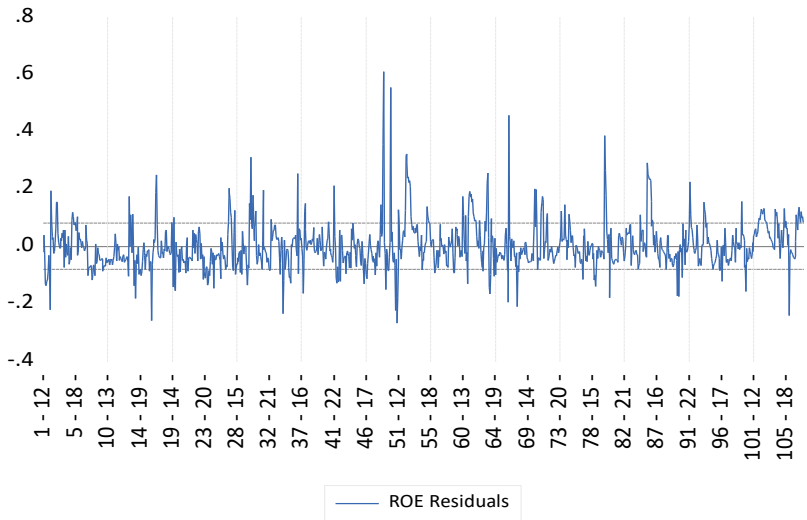

Figure 1. Heteroskedasticity Test

In addition to the visual inspection, we conducted a formal heteroskedasticity test to substantiate our findings. We utilized the Breusch-Pagan test to statistically evaluate the presence of heteroskedasticity in our regression model. The Breusch-Pagan test yielded a p-value of 0.072 (Table 6), which is greater than the 0.05 significance level. This indicates that we fail to reject the null hypothesis of homoskedasticity. Therefore, there is no significant evidence of heteroskedasticity in our model, corroborating the findings from the residual graph.

Table 6
Breusch-Pagan Test Results for Heteroskedasticity

Test Statistic	Degrees of Freedom	p-value	Decision (at 5% significance level)
3.24	1	0.072	Fail to reject null hypothesis

Finding

Descriptive statistic

The collected data was analyzed using descriptive statistics for each variable, with descriptive statistical tools to help describe the data in the form of mean, median, standard deviation, skewness, kurtosis, and the minimum-maximum value of a variable. The Karl Pearson correlation coefficient was applied to study the relationships between the coefficients of Intellectual capital, intangible assets, managerial ability, and firm performance. The Karl-Pearson correlation coefficient measures the linear relationship between two variables.

Table 7 provides descriptive statistics indicating that the total sample size examined was 1177 data points derived from 107 companies over eleven years from 2012 to 2022. The average ROA is 3.9%, with a range of -20% to 24.8% and a standard deviation of 6.7%. The average ROE during the study period was 14.7%, with a minimum value of -41.5%, a maximum of 74.7%, and a standard deviation of 15.1%. Similarly, NPM has an inconsistent average value compared to a median value of 12.8% and 9.9%. The values range from -13.3% to 48.9%, with a standard deviation of 11.5%. The predictor of firm performance, IC, has an average and median value of 15.58 and 10.20, with a standard deviation of 18.479. The second predictor is intangible assets, with an average value of 2.7%. Companies in Indonesia tend to report lower levels of intangible assets, ranging from zero to 22.8%, with a standard deviation of 4.1%. The manager's ability to achieve efficiency during the study has an average of 89.4%, ranging from 0.1% to 235.9%, and a standard deviation of 41.9%.

Table 7
Descriptive Statistics

Variable	N	Mean	Median	Maximum	Minimum	Std. Dev.
ROA	1177	0.039	0.037	0.248	-0.200	0.067
ROE	1177	0.147	0.142	0.747	-0.415	0.151
NPM	1177	0.128	0.099	0.489	-0.133	0.115
IC	1177	16.582	10.198	243.419	-134.361	38.479
INT	1177	0.027	0.012	0.228	0.000	0.041
MAN	1177	0.894	0.815	2.359	0.001	0.419
LEV	1177	1.231	0.615	10.788	0.000	1.796
SIZE	1177	29.562	29.731	33.655	21.975	2.149

Note(s): This table presents summary statistics of the variables used in primary analyses.

Correlation analysis

A correlation analysis was conducted to determine relationships between the independent and dependent variables. The matrix shows that Management Skill (MAN) is positively and significantly correlated with Leverage (LEV) at the 5% significance level. MAN and Intellectual Capital (IC) also have significant correlations at the 5% level with Net Profit Margin (NPM) and Return on Assets (ROA). The correlation between Firm Size (SIZE) and ROA is significant at 5%, while NPM and Return on Equity (ROE) show a strong correlation at the 1% level. Overall, the matrix shows mostly weak relationships among Intangible Assets (INT), LEV, MAN, IC, and SIZE, with INT moderately negatively correlated with SIZE ($r = -0.4586$) and weakly negatively correlated with LEV, MAN, and IC. LEV is weakly positively correlated with MAN ($r = 0.2108$) and weakly negatively correlated with IC. MAN has weak negative correlations with both IC and SIZE, while IC and SIZE are very weakly positively correlated ($r = 0.0252$).

Regression results

The best approach for each research model is determined based on the previous discussion to understand the relationship between intellectual capital, intangible assets, managerial capabilities, and company performance (measured by ROA, ROE, and NPM). The research findings are presented in regression models, which can be explained for each research model. The results of model 1 are shown in Table 8, indicating the F-statistic and significance level in the analysis of the variance table at a 95% confidence level. The coefficient of determination indicates 11.13%, implying that the combined contribution of intellectual capital, intangible assets, and managerial ability accounts for 11.13% of the variance in firm performance. The research reveals that the managerial ability variable has a positive and significant contribution at the 5% significance level, accounting for 2.67% of firm performance measured by ROA. On the other hand, the intellectual capital variable contributes positively and significantly at the 10% level,

representing a 0.02% change in ROA. That implies that the more companies invest in human resources, the better their performance measured by ROA tends to be. This finding aligns with research conducted by Ahmed et al., 2020, Isola et al., 2020, and Shahzad et al., 2022.

Table 8
Regression Data panel, Dependent Variable ROA

Dependent Variable: ROA				
Method: Panel EGLS (Cross-section random effects)				
Variable	Coefficient	Std. Error	t-Statistic	Sig.
C	-0.031504	0.186508	-0.168913	0.8662
IC	0.000238	0.000124	1.926961	0.0565*
INT	0.172262	0.196822	0.875218	0.3833
MAN	0.026727	0.011999	2.227432	0.0279**
LEV	-0.004323	0.002655	-1.628382	0.1062
SIZE	0.001456	0.006063	0.240064	0.8107
R-squared				0.111381
Adjusted R-squared				0.072745
F-statistic				2.882856
Prob(F-statistic)				0.017247

Note(s). * and ** represent level of significance at 1%, and 5% respectively

The results of model 2 are presented in Table 9, showing the F-statistic and significance level in the analysis of variance table with a confidence level much smaller than 95%. That indicates that the proposed research model is not suitable for predicting firm performance measured by ROE. Consequently, the tested variables do not yield results that contribute to changes in ROE, as evident from the significance values exceeding 0.05. The findings of this study reveal that intellectual capital, intangible assets, and managerial ability variables do not significantly contribute to changes in ROE. This result is consistent with research conducted by Chowdhury et al. (2018), Ionita & Dinu (2021), and Park & Byun (2021).

Table 9
Regression Data Panel, Dependent Variable ROE

Dependent Variable: ROE				
Method: Panel Least Squares				
Variable	Coefficient	Std. Error	t-Statistic	Sig.
C	0.199728	0.229705	0.869499	0.3864
IC	-0.000491	0.000369	-1.331525	0.1856
INT	-0.12062	0.389128	-0.309975	0.7571
LEV	-0.007511	0.008046	-0.933465	0.3525
MAN	0.009156	0.034438	0.265882	0.7908
LEV	-0.007511	0.008046	-0.933465	0.3525
SIZE	-0.001358	0.007367	-0.184377	0.854
R-squared				0.020489
Adjusted R-squared				-0.022099
F-statistic				0.4811
Prob(F-statistic)				0.789756

Note(s). * and ** represent level of significance at 1%, and 5% respectively

The research results are evident in the regression model that will be explained for each research model. The findings of model 3 are presented in Table 10, showing the F-statistic and significance level in the analysis of variance table with a confidence level of 95%. That indicates that this model can contribute to firm performance measured by NPM. The coefficient of determination is 10.31%, indicating that the contribution of intellectual capital, intangible assets, and managerial ability accounts for 10.31% of the increase in firm performance measured by NPM. The research results show that the managerial ability variable has a positive and significant contribution at the 5% level, accounting for 5.11% of the company's performance as measured by NPM.

On the other hand, the intellectual capital variable has a negative and significant contribution at the 5% level, accounting for 0.05% of the change in NPM. That implies that as companies invest more in human resources, it will decrease NPM. This finding aligns with research conducted by Xu et al. (2019). Furthermore, the contribution of managerial ability significantly affects NPM, aligning with the study by Ting et al. (2021).

Other research findings also indicate the presence of the variable "size," which has a significance value at the 10% level. Size contributes positively and significantly by 1.05% to NPM. The implication is that different company sizes will yield different NPM values. In model 3, it is evident that size can control the changes in intellectual capital and managerial ability of NPM.

Table 10
Regression Data panel, Dependent Variable NPM

Dependent Variable: NPM				
Method: Panel Least Squares				
Variable	Coefficient	Std. Error	t-Statistic	Sig.
C	-0.22567	0.167212	-1.3496	0.1798
IC	-0.00056	0.000268	-2.088782	0.0389**
INT	0.169958	0.283264	0.599999	0.5497
MAN	0.051066	0.025069	2.037007	0.0439**
LEV	0.00202	0.005857	0.344833	0.7309
SIZE	0.010503	0.005362	1.958688	0.0526*
R-squared				0.103198
Adjusted R-squared				0.064207
F-statistic				2.6467
Prob(F-statistic)				0.026496

Note(s). * and ** represent level of significance at 1%, and 5% respectively

The simultaneous regression model testing is presented in Tables 7, 8, and 9, indicating small F-statistic probability values below 0.05 for models 1 and 3. These results demonstrate that the regression models are well-fitted and can be used to predict changes in company performance measured by ROA and NPM.

The regression models formulated for models 1 and 3 have yielded satisfactory goodness of fit. Based on the panel data regression results, the regression models for model 1 and model 3 are as follows:

$$ROA_{it} = -0{,}0315 + 0{,}0002\ \text{IC} + 0{,}1723\ INT + 0.0267\ MAN + 0{,}0043\ \text{LEV} + \varepsilon$$
$$NPM_{it} = -0{,}0226 + 0{,}0010\ \text{IC} + 0{,}1670\ INT + 0.0510 MAN + 0{,}0020\ \text{LEV} + \varepsilon$$

Discussion

Based on the results of the panel data regression testing, it is evident that the models are well-fitted and capable of predicting the dependent variables, namely intellectual capital, intangible assets, and managerial ability, in models 1 and 3. The capability of these models to influence company performance in models 1 and 3 is only 11.13% and 10.31%, respectively, indicating that the remaining portion of the influence is attributed to other variables not included in the research model. Only intellectual capital and managerial ability can influence ROA and NPM in the partial testing results. Investments in human resources made by companies yield positive and significant results in increasing company performance measured by ROA. However, the contribution of intellectual capital to NPM shows a negative outcome.

Increasing the contribution of managerial ability by creating efficiency achieved by managers will increase ROA and NPM for the company. Managerial ability signifies a manager's aptitude for innovation and decision-making, which can lead to increased company efficiency. Decisions made by managers significantly impact the ROA and NPM levels of the company. However, the intangible asset variable is not able to influence company performance. The implications of this research for Indonesian companies are that investments in human resources are a viable strategy for enhancing company performance. However, companies must be cautious, as excessive investment may lead to negative NPM values. On the other hand, managers who can implement efficient strategies for company operations can improve company performance in terms of both ROA and NPM.

Additional findings related to control variables indicate that size influences company performance measured by NPM. Therefore, it is essential to note that size also influences intellectual capital and managerial ability. Companies should consider these variables when making investment decisions and evaluating company performance. The research model used in this study still yields a minimal contribution to understanding changes in company performance, with only 10.31% to 11.13%. For future research, adding specific variables is necessary to provide significant variation in company performance.

Conclusions

This study examined the impact of intellectual capital, intangible assets, and managerial ability on company performance, measured by Return on Assets (ROA), Return on Equity (ROE), and Net Profit Margin (NPM). Our findings reveal a positive correlation between a company's intellectual capital and managerial ability and its performance. Companies that invest in their employees and create a supportive intellectual environment see improvements in ROA and NPM, indicating that strategic investments in intellectual capital and efficient management are key to enhancing performance.

Based on these findings, we offer several practical recommendations. Companies should invest in employee training and development to strengthen their intellectual capital. Continuous professional development and knowledge-sharing initiatives can significantly enhance performance. Additionally, organizations should strategically manage their intangible assets, such as brand reputation and proprietary technology, to align with long-term goals. Developing a robust intellectual property strategy can provide a competitive edge. Enhancing managerial skills through recruitment, retention, and leadership training is also crucial for improving decision-making and operational efficiency.

However, our study has limitations. The variables we examined account for only 10.31% to 11.13% of the variance in company performance, suggesting that many other factors were not included. Future research should consider additional variables like market conditions, technological advancements, and regulatory changes to provide a more comprehensive understanding of company performance determinants. Furthermore, our study's geographic and industry-specific contexts may limit the generalizability of our findings. Expanding future studies to include diverse regions and industries would help validate our conclusions. Also, our study period may not capture the long-term effects of intellectual capital investments and managerial changes. Longitudinal studies could offer deeper insights into these sustained impacts.

References

Ahmed, S. S., Guozhu, J., Mubarik, S., Khan, M., & Khan, E. (2020). Intellectual Capital and Business Performance: The Role of Dimensions of Absorptive Capacity. Journal of Intellectual Capital, 21(1), 23–39. https://doi.org/10.1108/JIC-11-2018-0199

Andreou, P. C., Karasamani, I., Louca, C., & Ehrlich, D. (2017). The impact of managerial ability on crisis-period corporate investment. Journal of Business Research, 79(May 2017), 107–122. https://doi.org/10.1016/j.jbusres.2017.05.022

Barney, J. B. (1986). Organizational Culture: Can It Be a Source of Sustained Competitive Advantage?

The Academy of Management Review, 11(3), 656. https://doi.org/10.2307/258317

Barney, J. B. (1991). Firm Resources and Sustained Competitive Advantage. Journal of Management, 17(1), 99–120.

Barney, J. B. (2001). Resource-Based Theories of Competitive Advantage: A Ten-Year Retrospective on The Resource-Based View. Journal of Management, 27(6), 643–650. https://doi.org/10.1177/014920630102700602

Bayraktaroglu, A. E., Calisir, F., & Baskak, M. (2019). Intellectual capital and firm performance: an extended VAIC model. Journal of Intellectual Capital, 20(3), 406–425. https://doi.org/10.1108/JIC-12-2017-0184

Bazan, P., & Estevez, E. (2022). Industry 4.0 and business process management: state of the art and new challenges. Business Process Management Journal, 28(1), 62–80. https://doi.org/10.1108/BPMJ-04-2020-0163

Chan, K. H. (2009). Impact of intellectual capital on organisational performance: An empirical study of companies in the Hang Seng Index (Part 1). The Learning Organization, 16(1), 4–21. https://doi.org/10.1108/09696470910927641

Chen, H. L. (2021). Impact of industry 4.0 on corporate financial performance: a moderated mediation model. Sustainability (Switzerland), 13(11). https://doi.org/10.3390/su13116069

Cheng, T. Y., Li, Y. Q., Lin, Y. E., & Chih, H. H. (2020). Does the fit of managerial ability with firm strategy matters on firm performance. Journal of Asian Finance, Economics and Business, 7(4), 9–19. https://doi.org/10.13106/JAFEB.2020.VOL7.NO4.9

Chowdhury, L. A. M., Rana, T., Akter, M., & Hoque, M. (2018). Impact of intellectual capital on financial performance: evidence from the Bangladeshi textile sector. Journal of Accounting and Organizational Change, 14(4), 429–454. https://doi.org/10.1108/JAOC-11-2017-0109

Coordinating Ministry for Economic Affairs. (2020). Pemerintah Andalkan PEN Kejar Percepatan Pertumbuhan Ekonomi.

Coudounaris, D. N., Orero-Blat, M., & Rodríguez-García, M. (2020). Three decades of subsidiary exits: Parent firm financial performance and moderators. Journal of Business Research, 110(June 2019), 408–422. https://doi.org/10.1016/j.jbusres.2020.01.024

Demerjian, P., Lev, B., & McVay, S. (2011). Quantifying Managerial Ability : A New Measure and Validity Tests. Management Science, 58(7), 1229–1248. https://doi.org/10.2139/ssrn.1266974

Demerjian, P. R., Lev, B. I., & McVay, S. E. (2011). Quantifying Managerial Ability: A New Measure and Validity Tests. SSRN Electronic Journal, October. https://doi.org/10.2139/ssrn.1266974

Demerjian, P. R., Lev, B., Lewis, M. F., & McVay, S. E. (2013). Managerial ability and earnings quality. Accounting Review, 88(2), 463–498. https://doi.org/10.2308/accr-50318

Durand, C., & Milberg, W. (2020). Intellectual monopoly in global value chains. Review of International

Political Economy, 27(2), 404–429. https://doi.org/10.1080/09692290.2019.1660703

Education, S., & Business, S. R. (2017). Monopoly Profits, Efficiency Profit, and Teaching Strategic Management.

Garanina, T., & Pavlova, Y. (2011). Intangible Asset and Value Creation of a Company: Russian and UK Evidence. Proceedings of the 3rd European Conference on Intellectual Capital, 165–175.

Ghasemaghaei, M., Ebrahimi, S., & Hassanein, K. (2018). Data analytics competency for improving firm decision making performance. Journal of Strategic Information Systems, 27(1), 101–113. https://doi.org/10.1016/j.jsis.2017.10.001

Gupta, K., & Raman, T. V. (2021). Intellectual capital: a determinant of firms' operational efficiency. South Asian Journal of Business Studies, 10(1), 49–69. https://doi.org/10.1108/SAJBS-11-2019-0207

Haseeb, M., Hussain, H. I., Kot, S., Androniceanu, A., & Jermsittiparsert, K. (2019). Role of social and technological challenges in achieving a sustainable competitive advantage and sustainable business performance. Sustainability (Switzerland), 11(14). https://doi.org/10.3390/su11143811

Horne, J. C. Van. (2002). Financial Management and Policy. In Prentice Hall. https://doi.org/10.2307/2325369

Ionita, C., & Dinu, E. (2021). The Effect of Intangible Assets on Sustainable Growth and Firm Value – Evidence on Intellectual Capital Investment in Companies Listed on Bucharest Stock Exchange. Kybernetes, 50(10), 2823–2849. https://doi.org/10.1108/K-05-2020-0325

Isola, W. A., Adeleye, B. N., & Olohunlana, A. O. (2020). Boardroom female participation, intellectual capital efficiency and firm performance in developing countries: Evidence from Nigeria. Journal of Economics, Finance and Administrative Science, 25(50), 413–424. https://doi.org/10.1108/JEFAS-03-2019-0034

Jebran, K., & Chen, S. (2022). Corporate policies and outcomes during the COVID-19 crisis: Does managerial ability matter? Pacific Basin Finance Journal, 73(November 2021), 101743. https://doi.org/10.1016/j.pacfin.2022.101743

Kagermann, H., Wahlster, W., & Helbig, J. (2013). Recommendations for Implementing the Strategic Initiative Industrie 4.0. April.

Kauppila, O. P. (2015). Alliance Management Capability and Firm Performance: Using Resource-based Theory to Look Inside the Process Black Box. Long Range Planning, 48(3), 151–167. https://doi.org/10.1016/j.lrp.2013.08.006

Kedron, M. (2020). Goodwill and its effect on share price of manufacturing and nonmanufacturing companies. Acta Universitatis Agriculturae et Silviculturae Mendelianae Brunensis, 68(2), 373–381. https://doi.org/10.11118/actaun202068020373

Lee, J., & Shim, E. (1995). Moderating effects of R&D on corporate growth in U.S. and Japanese hi-tech industries: An empirical study. Journal of High Technology Management Research, 6(2), 179–191. https://doi.org/10.1016/1047-8310(95)90013-6

Lentjušenkova, O., & Lapina, I. (2016). The transformation of the organization's intellectual capital: from resource to capital. Journal of Intellectual Capital, 17(4), 610–631. https://doi.org/10.1108/JIC-03-2016-0031

Lindblad, J. T. (2015). Foreign Direct Investment in Indonesia: Fifty Years of Discourse. Bulletin of Indonesian Economic Studies, 51(2), 217–237. https://doi.org/10.1080/00074918.2015.1061913

Milala, S. I., Ariffin, K. M., Kasim, R., Yassin, A. M., Ishak, M. H., & Kasim, N. (2021). Intangible Asset a Key Driver for Company's Performance: An Overview. Proceedings of the International Conference on Industrial Engineering and Operations Management, 2555–2565.

Mohammad, H. S., & Bujang, I. (2019). Does intellectual capital influence firms' financial performance? A comparative analysis into three Malaysian industries. International Journal of Business and Society, 20(1), 260–276.

Mohammed, Z. O., & Ani, M. K. Al. (2020). The effect of intangible assets, financial performance and financial policies on the firm value: Evidence from omani industrial sector. Contemporary Economics, 14(3), 379–391. https://doi.org/10.5709/ce.1897-9254.411

Morbey, G. K., Reithner, R. M., Morbey, G. K., R, R. M. R. H., & Sales, D. A. (2017). How R & D Affects Sales Growth , Productivity and Profitability HOW R ia) AFFECTS SALES GROWTH ,. 6308(June).

Moreno, D., & Petrakis, E. (2022). The impact on market outcomes of the portfolio selection of large equity investors. Economics Letters, 212, 110296. https://doi.org/10.1016/j.econlet.2022.110296

Muwardi, D., Saide, S., Eko Indrajit, R., Iqbal, M., Siti Astuti, E., & Herzavina, H. (2020). Intangible resources and institution performance: The concern of intellectual capital, employee performance, job satisfaction, and its impact on organization performance. International Journal of Innovation Management, 24(5), 1–21. https://doi.org/10.1142/S1363919621500092

Nazari, J. A., & Herremans, I. M. (2007). Extended VAIC model: Measuring intellectual capital components. Journal of Intellectual Capital, 8(4), 595–609. https://doi.org/10.1108/14691930710830774

Park, W., & Byun, C. G. (2021). Effect of sme's managerial ability and executive compensation on firm value. Sustainability (Switzerland), 13(21), 1–16. https://doi.org/10.3390/su132111828

Porter, M. E. (1991). Towards A Dinamic Theory of Strategy. Strategic Management Journal, 12, 95–117.

Prakosa, B. G., Guritno, D. C., Anindita, T., Kurniawan, M., & Nugroho, A. C. (2024). Correlation among components of the Indonesian industry readiness index 4.0 and its implementation on socioeconomic along with the demographic aspects. Digital Transformation and Society, ahead-of-p(ahead-of-print). https://doi.org/10.1108/DTS-08-2023-0063

Pulic, A. (1998). Measuring the performance of intellectual potential in the knowledge economy. The 2nd" World Congress on the Management of Intellectual Capital", 8(1), 62–68.

Putra, A. A., Mela, N. F., & Putra, F. (2021). Managerial Ability and Real Earnings Management in Family Firms. CORPORATE GOVERNANCE, 21(7), 1475–1494. https://doi.org/10.1108/CG-02-2021-0083

Rahman, M. M., & Howlader, M. S. (2022). The impact of research and development expenditure on firm performance and firm value: evidence from a South Asian emerging economy. Journal of Applied Accounting Research, 23(4), 825–845. https://doi.org/10.1108/JAAR-07-2021-0196

Rajabalizadeh, J., & Oradi, J. (2022). Managerial ability and intellectual capital disclosure. Asian Review of Accounting, 30(1), 59–76. https://doi.org/10.1108/ARA-11-2020-0180

Rajapathirana, R. P. J., & Hui, Y. (2018). Relationship between innovation capability, innovation type, and firm performance. Journal of Innovation and Knowledge, 3(1), 44–55. https://doi.org/10.1016/j.jik.2017.06.002

Salehi, M., Ahmadzadeh, S., & Irvani Qale Sorkh, F. (2022). The impact of intellectual capital and related party transactions on contractual costs. International Journal of Productivity and Performance Management, 71(1), 156–181. https://doi.org/10.1108/IJPPM-03-2020-0088

Salim, N., Ab Rahman, M. N., & Abd Wahab, D. (2019). A systematic literature review of internal capabilities for enhancing eco-innovation performance of manufacturing firms. Journal of Cleaner Production, 209, 1445–1460. https://doi.org/10.1016/j.jclepro.2018.11.105

Sardo, F., & Serrasqueiro, Z. (2018). Intellectual capital, growth opportunities, and financial performance in European firms: Dynamic panel data analysis. Journal of Intellectual Capital, 19(4), 747–767. https://doi.org/10.1108/JIC-07-2017-0099

Scafarto, V., Ricci, F., & Scafarto, F. (2016). Intellectual capital and firm performance in the global agribusiness industry: The moderating role of human capital. In Journal of Intellectual Capital (Vol. 17, Issue 3, pp. 530–552). https://doi.org/10.1108/JIC-11-2015-0096

Seo, H. S., & Kim, Y. (2020). Intangible assets investment and firms' performance: Evidence from small and medium-sized enterprises in Korea. Journal of Business Economics and Management, 21(2), 423–445. https://doi.org/10.3846/jbem.2020.12022

Shahzad, F., Baig, M. H., Rehman, I. U., Saeed, A., & Asim, G. A. (2022). Does intellectual capital efficiency explain corporate social responsibility engagement-firm performance relationship? Evidence from environmental, social and governance performance of US listed firms. Borsa

Istanbul Review, 22(2), 295–305. https://doi.org/10.1016/j.bir.2021.05.003

Simamora, A. J. (2022). Crime Rate, Real Earnings Management and Managerial Ability. CORPORATE GOVERNANCE, 22(2), 405–423. https://doi.org/10.1108/CG-02-2021-0079

Soedarmono, W., Trinugroho, I., & Sergi, B. S. (2019). Thresholds in the nexus between financial deepening and firm performance: Evidence from Indonesia. Global Finance Journal, 40, 1–12. https://doi.org/10.1016/j.gfj.2018.08.001

Soetanto, T., & Liem, P. F. (2019). Intellectual capital in Indonesia: dynamic panel approach. Journal of Asia Business Studies, 13(2), 240–262. https://doi.org/10.1108/JABS-02-2018-0059

Soewarno, N., & Tjahjadi, B. (2020). Measures that matter: an empirical investigation of intellectual capital and financial performance of banking firms in Indonesia. Journal of Intellectual Capital, 21(6), 1085–1106. https://doi.org/10.1108/JIC-09-2019-0225

Tahat, Y. A., Ahmed, A. H., & Alhadab, M. M. (2018). The impact of intangibles on firms' financial and market performance: UK evidence. Review of Quantitative Finance and Accounting, 50(4), 1147–1168. https://doi.org/10.1007/s11156-017-0657-6

Ting, I. W. K., Tebourbi, I., Lu, W. M., & Kweh, Q. L. (2021). The Effects of Managerial Ability on Firm Performance and The Mediating Role of Capital Structure: Evidence from Taiwan. Financial Innovation, 7(1). https://doi.org/10.1186/s40854-021-00320-7

Torres, A. I., Ferraz, S. S., & Santos-Rodrigues, H. (2018). The impact of knowledge management factors in organizational sustainable competitive advantage. Journal of Intellectual Capital, 19(2), 453–472. https://doi.org/10.1108/JIC-12-2016-0143

Ulum, Ihyaul, Kharismawati, N., & Syam, D. (2017). Modified value-added intellectual coefficient (MVAIC) and traditional financial performance of Indonesian biggest companies Ihyaul Ulum *, Noviar Kharismawati and Dhaniel Syam. International Journal Of Learning and Intellectual Capital, 14(3), 207–219.

Vanacker, T., Zahra, S. A., & Holmes, R. M. (2021). Corporate entrepreneurship, country institutions and firm financial performance. Journal of World Business, 56(3), 101162. https://doi.org/10.1016/j.jwb.2020.101162

Vo, D. H., & Tran, N. P. (2021). Intellectual capital and bank performance in Vietnam. Managerial Finance, 47(8), 1094–1106. https://doi.org/10.1108/MF-03-2020-0143

Weqar, F., & Haque, S. M. I. (2020). Intellectual Capital and Corporate Financial Performance in India's Central Public Sector Enterprises. International Journal of Learning and Intellectual Capital, 17(1), 1. https://doi.org/10.1504/ijlic.2020.10023754

Widnyana, I. W., Wiksuana, I. G. B., Artini, L. G. S., & Sedana, I. B. P. (2021). Influence of financial architecture, intangible assets on financial performance and corporate value in the Indonesian capital market. International Journal of Productivity and Performance Management, 70(7),

1837–1864. https://doi.org/10.1108/IJPPM-06-2019-0307

Xu, J., & Li, J. (2022). The interrelationship between intellectual capital and firm performance: evidence from China's manufacturing sector. Journal of Intellectual Capital, 23(2), 313–341. https://doi.org/10.1108/JIC-08-2019-0189

Xu, J., Shang, Y., Yu, W., & Liu, F. (2019). Intellectual capital, technological innovation and firm performance: Evidence from China's manufacturing sector. Sustainability (Switzerland), 11(19), 1–15. https://doi.org/10.3390/su11195328

Yan, B., & Thewissen, J. (2021). Does managerial ability affect disclosure ? Evidence from earnings press releases. Asian Review of Accounting, 29(2), 192–226. https://doi.org/10.1108/ARA-03-2020-0036

Yang, K. P., Chiao, Y. C., & Kuo, C. C. (2010). The relationship between R&D investment and firm profitability under a three-stage sigmoid curve model: Evidence from an emerging economy. IEEE Transactions on Engineering Management, 57(1), 103–117. https://doi.org/10.1109/TEM.2009.2023452

Yaseen, S. G., Dajani, D., & Hasan, Y. (2016). The impact of intellectual capital on the competitive advantage: Applied study in Jordanian telecommunication companies. Computers in Human Behavior, 62, 168–175. https://doi.org/10.1016/j.chb.2016.03.075

Zhang, L., Yu, Q., Jin, Z., & Xu, J. (2021). Do Intellectual Capital Elements Spur Firm Performance? Evidence from the Textile and Apparel Industry in China. Mathematical Problems in Engineering, 2021. https://doi.org/10.1155/2021/7332885