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INTELLECTUAL CAPITAL AND COMPANY PERFORMANCE MODERATED BY BOARD OF DIRECTORS CHARACTERISTICS

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ABSTRACT

Purpose: This study aims to determine the effect of intellectual capital (IC) on company performance. In addition, this study also examines the role of board characteristics as moderation of intellectual capital on firm performance.

Methodology/approach: The sample consists of 140 non-financial companies listed on IDX during 2015–2019. The data analysis technique used in this research is panel data regression analysis.

Findings: The results show that intellectual capital is able to affect the company's performance on ROA, ROE, and TQ. Board characteristics through the Education Level and Board Size proxy are found to not be fully capable of moderating the relationship between IC and firm performance, while the gender proxy is found to be unable to moderate the relationship between IC and company performance.

Practical implications: The efficiency of intellectual capital can have an impact on improving the company's performance. The characteristics of the board become an important factor that strengthens the influence of IC on improving the company's performance.

Originality/value: The research contribution is measuring the effect of IC on market-based company performance. Furthermore, adding the effects of corporate governance that are measured by board characteristics as moderating



variables strengthens the relationship between IC and company performance.

Keywords: Board Characteristics; Company Performance; Corporate Governance; Intellectual Capital.

ABSTRAK

Tujuan penelitian: Penelitian ini bertujuan untuk mengetahui pengaruh dari modal intelektual (IC) pada kinerja perusahaan. Selain itu, penelitian ini juga meneliti terkait peran dari karakteristik dewan direksi dalam mempengaruhi hubungan antara modal intelektual pada kinerja perusahaan.

Metode/pendekatan: Sampel yang digunakan adalah 140 perusahaan non-keuangan yang terdaftar di BEI selama periode tahun 2015-2019. Teknik analisis data menggunakan analisis regresi pada data panel.

Hasil: Hasil penelitian ini menunjukkan bahwa modal intelektual mampu secara signifikan mempengaruhi kinerja perusahaan, baik itu pada ROA, ROE, maupun TQ. Karakteristik dewan direksi melalui proksi tingkat pendidikan dan ukuran dewan ditemukan tidak sepenuhnya mampu memoderasi hubungan IC dengan kinerja perusahaan, sedangkan proksi komposisi jenis kelamin ditemukan tidak mampu memoderasi hubungan IC pada kinerja perusahaan.

Implikasi praktik: Hasil penelitian menunjukkan bahwa efisiensi modal intelektual yang tercipta di perusahaan non-keuangan di Indonesia mampu berdampak pada peningkatan kinerja perusahaan. Karakteristik dewan direksi ditemukan mampu menjadi faktor penting yang memperkuat pengaruh IC pada peningkatan kinerja perusahaan.

Orisinalitas/kebaharuan: Kontribusi penelitian ini adalah mengukur pengaruh IC terhadap kinerja perusahaan berdasarkan pasar. Penelitian ini menguji pengaruh tata kelola yang diukur dari karakteristik dewan sebagai variabel moderasi dalam mempengaruhi hubungan IC dan kinerja perusahaan.

Kata kunci: Karakteristik Direksi; Kinerja Perusahaan; Modal Intelektual; Tata Kelola.

INTRODUCTION

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Rapid changes in the era of globalization make companies need to make adjustments in every aspect. This change is indicated by the speed of development of information and communication technology, science, to global competition ([Soewarno & Tjahjadi, 2020](#)). Contemporary companies differ from traditional ones in several ways. They effectively communicate information about their products and services, ensuring clarity. Employees are no longer limited to performing simple and repetitive tasks; instead, they possess the knowledge and skills necessary to generate value for the company. Additionally, the cost structure of modern companies has evolved, with production costs no longer being a major expense. Therefore, organizations in the present period require that their resources have the ability to generate or yield optimal value. This approach defines that when a business can add value, the business will enhance company performance ([Pulic, 2000](#)). Modern economic activities in this era of globalization have changed into a knowledge-based economy ([Yao, Haris, Tariq, Javaid, & Khan, 2019](#)). Thus, knowledge is the main resource in terms of creating added value to competitive advantage for the company. Knowledge that is able to generate added value, innovation, and growth for the company is referred to as Intellectual Capital (IC) ([Sardo & Serrasqueiro, 2018](#)).

IC is an intangible asset that is rare, valuable, irreplaceable, and inexhaustible. The company's investment in IC is one of the wealth-producing factors for the company compared to tangible resources, such as land, equipment, buildings, and others ([A. M. Hamdan, Buallay, & Alareeni, 2017](#)). The IC concept has become a concern in Indonesia since the issuance of PSAK 19 concerning Intangible Assets. However, there are several requirements that must be met in the PSAK, which make IC still cannot be reported directly in the financial statements. This makes it difficult for investors and interested parties to assess the IC potential of a company ([Ulum, Ghozali, & Purwanto, 2014](#)).

The limitations in IC measurement encourage experts to look for suitable measurement methods. The Value Added Intellectual Coefficient (VAIC) model, discovered by academic Ante Pulic, is a well-known IC measurement method in many countries using the concept of added value ([Pulic, 1998](#)). According to Pulic's follow-up research on [Pulic \(2000\)](#), VAIC is one of the most suitable methods for measuring IC because it reflects the value generated within the company, so that management can maximize the potential of the company. In his research, [Pulic \(2000\)](#) stated that in terms of creating added value, companies need the role of three components of Intellectual Capital (IC), namely Human Capital (HC), Structural Capital (SC), and Capital Employed (CE). This study will use Pulic's VAIC model in examining the relationship between IC and firm performance because this model is objective, simple, and easy to use to measure IC. In addition, this model is also better for statistical analysis and is suitable for comparisons between industries and countries ([Sardo & Serrasqueiro, 2018](#)). The data needed in this model can be obtained from the company's financial statements.

Intellectual capital is a critical asset for organizations seeking to generate value added. The value added is a result of the company's operations, specifically its performance, which contributes to the growth of the firm's wealth ([Pulic, 2000](#)). In general, several other studies, such as [A. M. Hamdan et al. \(2017\)](#); [A. Hamdan \(2018\)](#); [Lestari \(2017\)](#); [Wijayani \(2017\)](#); [Sardo, Serrasqueiro and Alves \(2018\)](#); [Smriti & Das \(2018\)](#); [Lubis & Ovami \(2020\)](#); [Soewarno & Tjahjadi \(2020\)](#); [Waikabu & Hariadi \(2021\)](#), who examined the relationship between IC and company performance using the VAIC model revealed that companies must have efficient IC to achieve good performance. However, there are also several studies, such as [Lestari](#)

(2017) and [Chairunissa & Dewi \(2015\)](#), which find that the efficiency of intellectual capital in a company is not able to improve company performance. The majority of intellectual capital research, especially research with samples of existing Indonesian companies, uses company performance as measured by the ratio of Return on Assets (ROA) and Return on Equity (ROE), which is a measurement of company performance using net income. Measurements that use market performance through the Tobin's Q (TQ) ratio are still rarely used to examine the impact of intellectual capital. Thus, this study examines the measurable impact that intellectual capital can have on the financial performance of ROA, ROE, and also the TQ market performance of non-financial companies listed on the Indonesia Stock Exchange from 2015 to 2019.

IC-related studies that have been carried out do not consider other factors that can affect the relationship between IC and company performance, such as the Corporate Governance (CG) variable. The addition of new CG variables needs to be done to further see the impact that the CG component can provide as one of the factors that strengthens the relationship between IC and company performance ([Smriti & Das, 2018](#); [Yao et al., 2019](#)). CG has many implications on the IC component that drives the company's performance, one of which is the board of directors who have the responsibility to pay attention to their human resources like they pay attention to other resources, including financial capital and physical capital in the company. Thus, the existence of CG awareness in identifying and managing IC can increase the efficiency of IC use in terms of increasing company performance and company value ([Keenan & Aggestam, 2001](#)).

The results of research with CG as one of the factors that influence the relationship of IC on company performance vary. The research of [A. M. Hamdan et al. \(2017\)](#) and [Waikabu & Hariadi \(2021\)](#) reveal that CG is able to strengthen the relationship of IC on company performance through ROA, ROE, and TQ ratios, but research by [Chairunissa & Dewi \(2015\)](#) found different things. In Indonesia, there are relatively few studies that consider CG factors as a moderating factor in the relationship of IC to company performance in Indonesia, and most studies use CG as a proxy for the CG Index or managerial ownership of companies within the same industry. The novelty of this research is to further examine corporate governance with proxy characteristics of the board of directors as a moderating factor in the relationship of IC to company performance in Indonesia across all industries, namely all non-financial companies listed on the Indonesia Stock Exchange. Based on the upper echelon theory, the roles and characteristics of the directors as top management are reflections of the company's performance. Thus, the proxy for the characteristics of the board of directors used in this study includes the level of education (Board Education level), composition (Board Size), and gender (Board Gender Composition). The nature of these variables was also investigated further in this study.

The objective of this research is to determine the effect of Intellectual Capital (IC) on company performance using resource-based theory and stakeholder theory. In addition, this study examines the role of board characteristics as moderation of intellectual capital on firm performance using upper echelon theory. The resource-based theory pioneered by [Wernerfelt \(1984\)](#) explains that regarding the company's resources, both tangible resources and intangible resources, the company must be able to identify and manage its resources in order to create value that has a direct or indirect impact on company performance ([Virgandhie, Rizkia, Rijanto, & Yuliati, 2017](#)). Stakeholder theory aims to assist management in knowing the parties that must be considered in making policy in the company (Freeman, 1990, in [Rankin, Ferlauto, McGowan and Stanton \(2017\)](#)). In this case, this theory is able to support company management that focuses on increasing added value from

company activities and minimizing potential losses of the stakeholders ([Virgandhie et al., 2017](#)). According to [Riahi-Belkaoui \(2003\)](#), this theory views the company's performance not from its profit in the current year, but its added value. Stakeholder theory is very closely related to value maximization because management that pays attention to stakeholders is able to create added value over time ([Rankin et al., 2017](#)). The creation of added value in this company can be done by utilizing the potential of the intellectual capital in the company. The company's success in creating added value from the use of intellectual capital will improve the company's performance for the benefit of the stakeholders.

Upper Echelon Theory is a theory developed by research by [Hambrick & Mason \(1984\)](#) that explains that the characteristic background of the board of directors is able to make these directors more innovative so that they are able to produce better strategies and decisions. Thus, the quality of the actions taken for the company will increase ([Al-Musali & Ku Ismail, 2015](#)). The differences in the characteristics of these directors come from many things, including differences in education, values, gender, and others. The differences that exist make each member of the board of directors have a different view of an existing situation, so that the solutions made to each situation vary.

The VAIC model used in this study is closely related to this theory. [Pulic \(2000\)](#) explains that companies can achieve maximum results if management is able to manage their resources in terms of creating value for the company. The better the use of resources by the company, the higher the efficiency of value creation in the company. Thus, the company can experience an increase in added value to market value.

The board of directors which is part of governance has an important role to identify, manage, and develop all potentials in intellectual capital which also affect the company's performance. Based on this, it can also be said that the board of directors has a fairly high level of control in making strategies and rules in managing resources, especially related to intellectual capital. Thus, studying the characteristics of the board of directors in accordance with this theory is something that needs to be done considering the role of the board of directors as one of the important keys to the performance of intellectual capital that is able to bring the company to achieve its maximum performance.

Influence of Intellectual Capital on Company Performance

The existence of economic developments that focus business activities on knowledge increases the interest of companies on the important role of intangible assets, such as Intellectual Capital (IC). IC is the result of human resource knowledge that is difficult to duplicate, which is in contrast to other tangible assets in the company, such as land, buildings, machinery, and others ([Soewarno & Tjahjadi, 2020](#)). IC plays a role in creating value for a company ([Smriti & Das, 2018](#)). This role is also referred to as a wealth generator because it is able to improve performance to achieve competitive advantage ([Xu & Li, 2020](#)).

IC as one of the creators of added value for the company consists of three components, namely Human Capital (HC), Structural Capital (SC), and Capital Employed (CE). HC is the knowledge of each individual human resource in the company, while SC is the knowledge in the company in the form of databases, company processes, strategies, and other knowledge related to HC. Then CE is the ability of the company to manage its resources, both in the form of physical capital and financial capital ([Soewarno & Tjahjadi, 2020](#)). The efficiency of these three components in creating added value for the company can be measured using the VAIC model by [Pulic \(1998\)](#). The model will accumulate the added value created by each

component (HCE, SCE, and CEE) to determine the overall efficiency created by intellectual capital, hereinafter referred to as ICE (Intellectual Capital Efficiency).

Research that uses the VAIC model in examining the effect of ICE on company performance generally finds the same thing, namely there is a significant positive effect produced by ICE on company performance. Research of [Smriti & Das \(2018\)](#) using 710 publicly listed companies in India found that there was a positive and significant relationship between ICE and company performance through ROA, and ICE and market performance through TQ. On the other hand, different things were found in the research of [Chairunissa & Dewi \(2015\)](#), namely ICE had a negative effect on the market performance of financial companies listed on the Indonesia Stock Exchange. Research conducted in Indonesia regarding intellectual capital usually uses samples that focus on one industry, such as the research of [Chairunissa & Dewi \(2015\)](#), [Lestari \(2017\)](#), [Wijayani \(2017\)](#), and [Lubis & Ovami \(2020\)](#) so that they can provide results. However, previous research related to intellectual capital efficiency shows that good intellectual capital management will improve company performance, both market performance and financial performance, such as research by [Wijayani \(2017\)](#), [Sardo et al. \(2018\)](#), [Smriti & Das \(2018\)](#), [Lubis & Ovami \(2020\)](#), [Waikabu & Hariadi \(2021\)](#), and [Virgandhie et al. \(2017\)](#). This is certainly in line with the theory presented by [Pulic \(1998\)](#), where good management of intellectual capital (ICE) can create added value and a competitive advantage for the company. Currently, companies are also more focused on the use of knowledge-based resources to survive in the era of globalization and to promote the growth of the modern knowledge-based economy.

Resource based theory and stakeholder theory also state that a company can achieve maximum results if the company's management is able to manage all its resources properly in creating added value for the company. The management of these resources can be reflected through the good efficiency that can be created by intellectual capital as one of the company's resources. The maximum results that can be achieved will certainly be reflected in the company's performance through ratios, such as ROA, ROE, and Tobin's Q. Therefore, the hypothesis that will be formed to see the effect of IC management efficiency on company performance is as follows:

H1. Intellectual Capital has a positive effect on company performance.

The Effect of Board Characteristics in Moderating the Relationship of Intellectual Capital on Company Performance

Companies that have good governance practices have many advantages. Good governance practices can be reflected through the performance of the management, particularly through the board of directors. Governance plays a role in creating, developing, and utilizing intellectual capital through human resources, structures, and processes within the company ([Keenan & Aggestam, 2001](#)). Therefore, it can also be said that governance is an important key in the intellectual capital (IC) performance of the company. This is supported by the research of [Holland \(2001\)](#) and [A. M. Hamdan et al. \(2017\)](#) who found that the quality of governance has an influence in strengthening the relationship between the efficiency of the IC component (ICE) in improving company performance. In Indonesia, there are several studies on the role of CG in strengthening the relationship between IC and company performance. The first research is conducted by [Waikabu & Hariadi \(2021\)](#) who use the Corporate Governance Perception Index (CGPI) as a CG proxy. The results of this study

indicate that governance is able to strengthen the relationship between IC and market performance in Indonesia. The next research in Indonesia that uses governance as moderation is the research of [Chairunissa & Dewi \(2015\)](#) with managerial ownership as a CG proxy. The result of this research show that governance represented by managerial ownership is not able to moderate the relationship between IC and firm performance on the ROA and Tobin's Q ratios.

Based on the variety of research results and proxies related to the influence of CG in strengthening the relationship between IC and company performance, this study explores more deeply the influence that can be given by CG, especially related to the characteristics of the board of directors in relation to IC and company performance according to research by [Holland \(2001\)](#); [Chairunissa & Dewi \(2015\)](#); [A. M. Hamdan et al. \(2017\)](#); and [Waikabu & Hariadi \(2021\)](#). The study on the effects of the characteristics of the board of directors as a moderating variable will use a variety of proxies and a more in-depth analysis of the characteristics of the board of directors, namely through the Board Education level, Board Size, and Board Gender Composition proxies. The board of directors is part of the governance mechanism that has a function in providing signals to external parties regarding the quality of governance that is able to influence the value and investment interest of the company ([Berezinets, Garanina, & Ilina, 2016](#)). Thus, this study uses the proxy of the board of directors as the object of research that represents CG because it is the driver of the intellectual capital management.

The board of directors is an elected individual who is tasked with overseeing the operational activities, including the system of relationships, processes, and structures that aim to implement corporate governance and protect the rights and interests of the stakeholders. One of the characteristics of the board of directors is the level of education. Due to their level of education, directors can have more knowledge to be able to make decisions that are more relevant in dealing with difficult situations ([Berezinets et al., 2016](#)). According to research by [Berezinets et al. \(2016\)](#) and [Boadi & Osarfo \(2019\)](#), the level of education possessed by the board of directors has an influence in improving the company performance. The level of education is also proven to have an influence in the management of the intellectual capital which is one of the resources in the company as evidenced by [Al-Juaidi \(2020\)](#).

According to the upper echelon theory, a high level of education is related to an open mind, tolerance for change, and adequate capacity to process information ([Boadi & Osarfo, 2019](#); [Hambrick & Mason, 1984](#)). When a company appoints a board of directors to serve, these directors are expected to protect and manage the company well for the benefits of all the stakeholders. This is also in line with the concept of the stakeholder theory which says that the directors who have adequate insight and knowledge, of course, know well that they must work optimally, both in managing resources and other operational activities to maximize the results that will be given to the stakeholders. Based on the explanation of the upper echelon theory and stakeholder theory related to the education level of the directors and their role in improving the performance of the intellectual capital management and the company performance, the education level of the board of directors can be said to be one of the factors that support the performance of intellectual capital in improving the company performance. Thus, the hypothesis formed in this study is as follows:

Board Size is another important component of governance that has a role in overseeing management and protecting the interests of the shareholders as stated by Fama and Jensen (1983) in [Elsye Hatane, Gomes I and Sastrawati \(2017\)](#). Therefore, the development and selection of an effective composition of the board of directors is an important issue and choice to achieve optimal corporate governance. In addition, the company also has advantages through the board of directors that has an appropriate and structured composition, among others, increasing the information circulation and operational management, as well as reducing the occurrence of information asymmetry ([Dalwai & Mohammadi, 2020](#)). In Indonesia, there are studies that examine the effect of the size of the board of directors as a proxy for CG on the company's financial performance. The study was conducted [Felicia & Edi \(2022\)](#) with results showing that the size of the board of directors has a positive and significant effect on the financial performance of companies in Indonesia.

The size of the board of directors is also found to have a role in increasing the efficiency of the use of intellectual capital in the company. This is proven through research by [Dalwai & Mohammadi \(2020\)](#) and [Oktaviana & Setiawan \(2022\)](#) which shows a significant positive relationship between the size of the board of directors and the efficiency of intellectual capital management (ICE). Thus, it can be said that the presence of the board of directors is able to improve the performance of intellectual capital management efficiently in the company. Improving the performance of intellectual capital as one of the resources can improve the company's performance. With the increase in the company performance, it can be said that the directors have fulfilled their responsibilities in maximizing the profits of the stakeholders, in accordance with the stakeholder theory. Based on this, the hypothesis formed is as follows:

H2b. Board Characteristics through Board Size proxy strengthens Intellectual Capital's relationship to company performance.

In addition to the education level of the board and board size, board gender composition is also a proxy for the characteristics of the board of directors in a company. Board gender composition is used to measure the composition of female and male directors in the company. The large proportion of women on the board of directors provides some additional perspectives that are not necessarily available to male board members, such as being more risk-averse and more conscientious. The characteristics possessed by female directors make female directors not in a hurry to make decisions. Given this problem, several studies such as those conducted by [Oktaviana & Setiawan \(2022\)](#) and [Tejedo-Romero, Rodrigues and Craig \(2017\)](#) discussed the relationship between board gender composition and ICE. The result of these studies show that the board gender composition has a positive effect on ICE. This can illustrate that the presence of female directors in the company has an important role because women can better understand the environment and surroundings.

The research of [Shahzad, Hussain Baig, Rehman, Latif and Sergi \(2019\)](#) which discusses the relationship between board gender composition on ICE and financial performance finds that board gender composition has a positive and significant influence on intellectual capital and financial performance. Thus, the presence of female directors helps companies to identify valuable resources, such as intellectual capital, that can improve company performance. Based on the upper echelon theory, the gender composition of the directors can be one of the things that triggers an increase in company performance. Therefore, the characteristics of the board of directors as one of the important drivers in governance can be a factor that strengthens the relationship between intellectual capital efficiency and company performance. Thus, the hypothesis formed is as follows:

H2c. Board Characteristics through Board Gender Composition proxy strengthens Intellectual Capital 's relationship to company performance

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METHOD

In this study, the samples are non-financial companies listed on the Indonesia Stock Exchange based on the 2015-2019 IDX factbook. The selection of research samples used a purposive sampling method using various specified criteria. Based on the IDX factbook, there are 632 listed companies, excluding a total of 105 financial companies because these companies have different structures and financial statement components. And also, companies that conducted IPOs after 2015 will be excluded from the sample because they do not have an annual report for the 2015 period. Companies that do not include complete data for research purposes will also be excluded from the sample. Companies that are included in the research observations are companies that have positive equity data, governance data, and complete employee cost data (training costs, recruitment, salaries, benefits, and others).

Sample Selection Criteria	Number of Companies
Companies listed on the IDX (based on the IDX 2019 factbook)	632
Financial companies listed in the IDX 2019 factbook	(105)
Companies with incomplete annual reports and conducting IPOs after 2015	(120)
Companies that do not include complete data according to research needs	(267)
Companies used as samples	140

Table 1.
Research Sample Selection

This study dependent variable is company's performance that measured by three indicators. The first indicator is the measurement of financial performance through the ratio of Return on Assets (ROA). ROA is one of the company's profitability benchmarks that measures how companies use total assets in creating profits (net income) for the company. A high ROA indicates a good company performance (Gitman & Zutter, 2015). ROA is obtained by comparing net income with the average total assets. The ROA formula is as follows:

$$ROA_{it} = \frac{Net\ Income_{it}}{Total\ Asset_{it}}$$

The second indicator is Return on Equity (ROE). ROE is also one of the ratios that can be used to measure company profitability. The higher the ROE value can indicate the existence of good cash and capital management (Gitman & Zutter, 2015; Lestari, 2017). ROE can be known through the following calculations:

$$ROE_{it} = \frac{Net\ Income_{it}}{Total\ Equity_{it}}$$

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The third is the Tobin's Q ratio, which is one of the ratios used to measure the company's market performance, measured by the ratio of the market value of the firm to the replacement cost of its assets (Chung & Pruitt (1994). In general, Tobin's Q can be measured by adding the market value equity that can be obtained from Capital IQ with the total debt,

then divided by the total assets owned by the company. Tobin's Q ratio with a value of more than one indicates that the value of the company is greater than the asset value or book value of the company. According to [Chung & Pruitt \(1994\)](#), the formula of Tobin's Q is as follows:

$$\text{Tobin's } Q_{it} = \frac{\text{Market Value Equity}_{it} + \text{Total Debt}_{it}}{\text{Total Asset}_{it}}$$

The main independent variable used in this study is Intellectual Capital (IC). In terms of measuring the efficiency of intellectual capital on company performance, this study uses the Value Added Intellectual Coefficient (VAIC) model formed by [Pulic \(2000\)](#) to determine the value of Intellectual Capital Efficiency (ICE). The value added measurement used in the VAIC model is obtained through the formula as follows:

$$ICE_{it} = HCE_{it} + SCE_{it} + CEE_{it}$$

To find out the value of each IC component which is proxied as HCE, SCE, and CEE in order to obtain ICE, there are separate calculations that must be done. The value added (VA) must be known before calculating the components. VA calculation is done by adding operating profit with employee costs, depreciation costs, and amortization costs (Value Added = Operating Profit + Employee Costs + Depreciation Costs + Amortization). Operating profit is used in the calculation because it is the result of deducting the company's costs from revenue. Then the addition of employee costs, depreciation costs, and amortization costs is carried out because of their active role in creating added value for the company ([A. M. Hamdan et al., 2017](#); [Pulic, 2000](#)). Employee costs consist of all costs related to employees, including salaries, benefits, training, recruitment, and the like. After knowing the value added, the efficiency value of each component to obtain the ICE value can be determined by the following calculation:

1. HCE (Human Capital Efficiency) shows how much added value can be generated by spending on the company's workforce. The formula for HCE is $HCE = VA/HC$, where VA is added value, and HC (Human Capital) is the total cost of salaries and wages of employees.
2. SCE (Structural Capital Efficiency) measures the ability of structural capital to create added value for the company. The formula for SCE is $SCE = SC/HC$, where VA is added value, and SC (Structural Capital) is the sum of VA minus HC.
3. CEE (Capital Employed Efficiency) is an indicator measuring the company's ability to create added value through the management of physical capital and financial capital. The formula for CEE is $CEE = VA/CE$, where VA is value added, and CE (Capital Employed) is total equity.

This study uses the moderating variable of the characteristics of the board of directors to see its effect on the relationship between IC and company performance. The proxy characteristics of the board of directors used are as follows:

1. Board Education level is the diversity of education levels that can be seen through the level of education that has been taken by each director in a company. The higher the score obtained, the higher the diversity of the level of education and insight of the board of directors. The score for directors with a high school education level is 1, an undergraduate education level is 2, a magister education level is 3, and a doctoral

education level is 4. The formula for calculating the score is taken from [Putri \(2020\)](#) as follows:

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$$EDLEVEL_{it} = \text{Total score of the board of directors' education level assessment}_{it}$$

2. Board Size or often referred to as the composition of the board is the number of directors in the company ([Dalwai & Mohammadi, 2020](#)). Thus, the formula for calculating the size of the board is as follows:

$$BSIZE_{it} = \text{Number of members of the board of directors in the company}_{it}$$

3. Board Gender Composition is a proxy for the characteristics of the company's board of directors that is used to measure the composition of female and male directors in the company. Measurement can be done by measuring the number of female directors against the total number of board of directors ([Zakaria, Suherman, Buchdadi, Rahmayanti, & Siregar, 2021](#)). The formula for the board gender composition is as follows:

$$GNDR_{it} = \frac{\text{Number of female directors}_{it}}{\text{Total Directors}_{it}}$$

Control variables are variables that are considered constant and generally are not interesting for research purposes but are controlled because they affect the results. In this study, there are 3 control variables, namely Firm Size, Firm Age, and Leverage. Firm Size is one of the control variables used to measure the company through the calculation of the natural logarithm of the company's total assets ([Lestari, 2017](#)). Next, firm age measures the length of time the company runs its business operations and maintains its existence in the business world ([A. M. Hamdan et al., 2017](#)). Firm age calculation is done by reducing the current year according to the object of research (between 2015 and 2019) with the IPO year, then the results of the reduction will be added 1. The last control variable is leverage which is a variable to measure the company's leverage level through a comparison of total debt with total assets ([Sardo & Serrasqueiro, 2018](#)).

The research model used in this study is divided into two, to test hypothesis 1 and hypothesis 2. The first model (model 1) is a model to test the relationship of ICE and control variables on company performance which consists of 3 proxies, namely ROA, ROE, and TQ. Then the second model is used to test hypothesis 2 which relates to the moderating test of the characteristics of the board of directors on the relationship between ICE and company performance which also consists of 3 proxies, namely ROA, ROE, and TQ. In the second model, the characteristics of the board of directors with the EDLEVEL, BSIZE, and GNDR proxies were tested individually as independent variables along with ICE which can be seen in model 2a. Each proxy characteristic of the board of directors (BC) then acts as a variable that interacts with ICE (ICE*EDLEVEL; ICE*BSIZE; ICE*GNDR). Testing of models 2a and 2b with the placement of BC as an independent variable and as an interaction variable aims to test its moderating nature by using the method of [Sharma, Durand and Gur-Arie \(1981\)](#). The research models are as follows:

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Model 1:

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$$\begin{aligned} ROA_{it} &= \alpha + \beta_1 ICE_{it} + \beta_2 SIZE_{it} + \beta_3 AGE_{it} + \beta_4 LEV_{it} + \epsilon_{it} \\ ROE_{it} &= \alpha + \beta_1 ICE_{it} + \beta_2 SIZE_{it} + \beta_3 AGE_{it} + \beta_4 LEV_{it} + \epsilon_{it} \\ TQ_{it} &= \alpha + \beta_1 ICE_{it} + \beta_2 SIZE_{it} + \beta_3 AGE_{it} + \beta_4 LEV_{it} + \epsilon_{it} \end{aligned}$$

Model 2a:

Proxy Board Characteristics 1 (Board Education Level)

$$ROA_{it} = \alpha + \beta_1 ICE_{it} + \beta_2 EDLEVEL_{it} + \beta_3 SIZE_{it} + \beta_4 AGE_{it} + \beta_5 LEV_{it} + e_{it}$$

$$ROE_{it} = \alpha + \beta_1 ICE_{it} + \beta_2 EDLEVEL_{it} + \beta_3 SIZE_{it} + \beta_4 AGE_{it} + \beta_5 LEV_{it} + e_{it}$$

$$TQ_{it} = \alpha + \beta_1 ICE_{it} + \beta_2 EDLEVEL_{it} + \beta_3 SIZE_{it} + \beta_4 AGE_{it} + \beta_5 LEV_{it} + e_{it}$$

Proxy Board Characteristics 2 (Board Size)

$$ROA_{it} = \alpha + \beta_1 ICE_{it} + \beta_2 BSIZE_{it} + \beta_3 SIZE_{it} + \beta_4 AGE_{it} + \beta_5 LEV_{it} + e_{it}$$

$$ROE_{it} = \alpha + \beta_1 ICE_{it} + \beta_2 BSIZE_{it} + \beta_3 SIZE_{it} + \beta_4 AGE_{it} + \beta_5 LEV_{it} + e_{it}$$

$$TQ_{it} = \alpha + \beta_1 ICE_{it} + \beta_2 BSIZE_{it} + \beta_3 SIZE_{it} + \beta_4 AGE_{it} + \beta_5 LEV_{it} + e_{it}$$

Proxy Board Characteristics 3 (Board Gender Composition)

$$ROA_{it} = \alpha + \beta_1 ICE_{it} + \beta_2 GNDR_{it} + \beta_3 SIZE_{it} + \beta_4 AGE_{it} + \beta_5 LEV_{it} + \epsilon_{it}$$

$$ROE_{it} = \alpha + \beta_1 ICE_{it} + \beta_2 GNDR_{it} + \beta_3 SIZE_{it} + \beta_4 AGE_{it} + \beta_5 LEV_{it} + \epsilon_{it}$$

$$TQ_{it} = \alpha + \beta_1 ICE_{it} + \beta_2 GNDR_{it} + \beta_3 SIZE_{it} + \beta_4 AGE_{it} + \beta_5 LEV_{it} + \epsilon_{it}$$

Model 2b:

Proxy Board Characteristics 1 (Board Education Level)

$$ROA_{it} = \alpha + \beta_1 ICE_{it} + \beta_2 EDLEVEL_{it} + \beta_3 (ICE * EDLEVEL)_{it} + \beta_4 SIZE_{it} + \beta_5 AGE_{it} + \beta_6 LEV_{it} + \epsilon_{it}$$

$$ROE_{it} = \alpha + \beta_1 ICE_{it} + \beta_2 EDLEVEL_{it} + \beta_3 (ICE * EDLEVEL)_{it} + \beta_4 SIZE_{it} + \beta_5 AGE_{it} + \beta_6 LEV_{it} + \epsilon_{it}$$

$$TQ_{it} = \alpha + \beta_1 ICE_{it} + \beta_2 EDLEVEL_{it} + \beta_3 (ICE * EDLEVEL)_{it} + \beta_4 SIZE_{it} + \beta_5 AGE_{it} + \beta_6 LEV_{it} + \epsilon_{it}$$

Proxy Board Characteristics 2 (Board Size)

$$ROA_{it} = \alpha + \beta_1 ICE_{it} + \beta_2 BSIZE_{it} + \beta_3 (ICE * BSIZE)_{it} + \beta_4 SIZE_{it} + \beta_5 AGE_{it} + \beta_6 LEV_{it} + \epsilon_{it}$$

$$ROE_{it} = \alpha + \beta_1 ICE_{it} + \beta_2 BSIZE_{it} + \beta_3 (ICE * BSIZE)_{it} + \beta_4 SIZE_{it} + \beta_5 AGE_{it} + \beta_6 LEV_{it} + \epsilon_{it}$$

$$TQ_{it} = \alpha + \beta_1 ICE_{it} + \beta_2 BSIZE_{it} + \beta_3 (ICE * BSIZE)_{it} + \beta_4 SIZE_{it} + \beta_5 AGE_{it} + \beta_6 LEV_{it} + \epsilon_{it}$$

Proxy Board Characteristics 3 (Board Gender Composition)

$$ROA_{it} = \alpha + \beta_1 ICE_{it} + \beta_2 GNDR_{it} + \beta_3 (ICE * GNDR)_{it} + \beta_4 SIZE_{it} + \beta_5 AGE_{it} + \beta_6 LEV_{it} + \epsilon_{it}$$

$$ROE_{it} = \alpha + \beta_1 ICE_{it} + \beta_2 GNDR_{it} + \beta_3 (ICE * GNDR)_{it} + \beta_4 SIZE_{it} + \beta_5 AGE_{it} + \beta_6 LEV_{it} + \epsilon_{it}$$

$$TQ_{it} = \alpha + \beta_1 ICE_{it} + \beta_2 GNDR_{it} + \beta_3 (ICE * GNDR)_{it} + \beta_4 SIZE_{it} + \beta_5 AGE_{it} + \beta_6 LEV_{it} + \epsilon_{it}$$

Description of Research Model:

ROA_{it} = company's financial performance (profitability) is measured through the ratio of Return On Assets; ROE_{it} = company's financial performance (profitability) is measured through the ratio of Return On Equity; TQ_{it} = company performance as reflected in market performance through Tobin's Q ratio measurement; ICE_{it} = efficiency created by the component of intellectual capital obtained by summing the efficiency of the component of intellectual capital; EDLEVEL_{it} = total score of the board of directors' education level; BSIZE_{it} = number of members of the board of directors in the company; GNDR_{it} = number of female board of directors to number of directors; (ICE*EDLEVEL)_{it} = interaction between the education level of the board of directors in the company and the relationship of ICE to performance; (ICE*BSIZE)_{it} = interaction of the size of the board of directors in the company with the relationship of ICE to performance; (ICE*GNDR)_{it} = interaction of the number of female board of directors in the company with the relationship of ICE to performance; SIZE_{it} = a measure of the size of a company; AGE_{it} = age of the company since the company was founded; LEV_{it} = ratio of total liabilities to total assets.

Data Analysis Techniques

The data analysis technique used in this research is panel data regression analysis using Stata16 software. The stages of data analysis start from descriptive statistics to see the mean, standard deviation, maximum, and minimum. Treatment for descriptive statistic is done by changing the outlier data or variables that exceed the maximum and minimum value limits, into the upper or lower limit values using [Leys, Ley, Klein, Bernard and Licata \(2013\)](#) method which is calculated by the value of means subtracting or adding 3 times the value of standard deviation. The step is panel data regression test to see whether the model is Pooled Ordinary Least Square model (OLS) or Fixed Effect Model (FEM) or Random Effect Model (REM) by using Chow test, Hausman test, and Lagrange multiplier test. After that, the next step is the classic assumption test that includes normality test, multicollinearity test, heteroscedasticity test, and autocorrelation test. The normality test is carried out to test whether the data were normally distributed or not. However, according to [Gujarati & Porter \(2009\)](#), research that uses more than 30 data can ignore the normality assumption by using the Central Limit Theorem (CLT) assumption where it can be concluded that all the variables used have met the normality assumption. The multicollinearity test is carried out to test whether or not there is a high correlation between the independent variables in the multiple linear regression model by checking the tolerance value indicated <10 or VIF>10. Afterwards, the heteroscedasticity test examines the inequality between variances in the regression model from one observation to another ([Ghozali, 2018](#)). If the result of the prob value is <0.05 there is a symptom of heteroscedasticity. Therefore, it is necessary to do treatment using the White Test or also known as robust standard errors ([Gujarati & Porter,](#)

2009). Last, the autocorrelation test is conducted for this study using the Durbin-Watson test. Through the Durbin-Watson table calculations, if there is a symptom of autocorrelation, a treatment is carried out by using the clustered at firm level method.

RESULTS AND DISCUSSION

Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
ROA	700	0.0516	0.0584	-0.1576	0.2619
ROE	700	0.0934	0.1829	-0.7883	0.9733
TQ	700	1.6239	1.5631	0.3338	8,511
ICE	700	4.3653	3.0246	-7.0996	15.6874
EDLEVEL	700	12.8514	4.7640	5	27
BSIZE	700	5.2729	1.8292	2	11
GNDR	700	0.1235	0.1762	0	0.6546
SIZE	700	15.5161	1.5012	11,409	19,679
AGE	700	3.5466	0.5684	1.817	5,273
LEV	700	0.4571	0.1971	0.0407	1.0583

Table 2.
Descriptive
Statistical
Results

Source: data processed by STATA, 2022

The results of the descriptive statistical tests using Stata16 show the minimum value, maximum value, mean value, and standard deviation value of each of the variables that is used in this research. Besides, in this research the minimum and maximum values for each research variable have been ensured not to exceed the upper and lower limits of each variable. So, the action taken to overcome the variables that have a fairly large distribution of data is to do treatment. The treatment is done by using [Leys et al. \(2013\)](#).

Selection of Panel Data Regression Test

Effect Test	ROA Model	ROE Model	TQ Model
	Prob.		
F(139,553)	25.47	8.83	19.26
Prob > F	0.0000	0.0000	0.0000

Table 3.
Chow Test
Results

Source: data processed by STATA, 2022

The Chow test table shows that the probability is $0.000 < 0.05$, so the chosen model is FEM.

Effect Test	ROA Model	ROE Model	TQ Model
	Prob.		
Chi-square (7)	28.95	30.75	52.68
Pros > Chi2	0.0001	0.0001	0.0000

Table 4.
Hausman Test
Results

Source: data processed by STATA, 2022

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The Hausman test table shows that the probability is $0.000 < 0.05$, so the chosen model is FEM.

Based on the Chow test and Hausman test, it can be concluded that the fixed-effect model is superior to the random-effect model and the pooled OLS model; thus, the fixed-effect model is used.

Classic assumption test

Variable	Skewness	Kurtosis
ROA	1.3171	6.5826
ROE	0.7873	12.1664
TQ	2.9441	12.0964
ICE	0.8521	6.9236
EDLEVEL	0.4856	2.8620
BSIZE	0.6349	3.2200
GNDR	1.3166	3.8337
SIZE	-0.0007	2.8088
AGE	-0.0918	3.8290
LEV	0.1114	2.3673

Table 5.
Normality Test Results

Source: data processed by STATA, 2022

Table 7 shows that the majority of the variables used in this study have normal data because the resulting skewness value is close to zero and the kurtosis is close to three. If the data does not fit into these criteria, it can be concluded that the data is not normally distributed. Therefore, the treatment is by using the CLT assumption where it can be concluded that all the variables used have met the normality assumption.

Variable	VIF	1/VIF
EDLEVEL	7.95	0.1258
BSIZE	7.24	0.1381
SIZE	1.76	0.5673
AGE	1.14	0.8751
ICE	1.14	0.8795
LEV	1.11	0.9008
GNDR	1.04	0.9586
Mean VIF	3.06	

Table 6.
Multicollinearity Test Results

Source: data processed by STATA, 2022

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Table 8 shows that this study did not have multicollinearity. This can be seen in the mean VIF which is below the value of 10, so it can be said to be free from multicollinearity symptoms in the independent variables in the research model.

Table 7.
Heteroscedasticity Test Results

Breusch-Pagan / Cook-Weisberg test	ROA	ROE	TQ
	Prob.		
Chi-square(1)	128.92	53.2	160.32
Pros > Chi2	0.0000	0.0000	0.0000

Source: data processed by STATA, 2022

The heteroscedasticity test examines the inequality between variances in the regression model from one observation to another (Ghozali, 2018). Table 9 shows that the probability value of Chi 2 (Prob > Chi2) is 0.0000 which is smaller than the significance level of 5% or 0.05. Thus, it can be concluded that there are symptoms of heteroscedasticity in the research model. Therefore, it is necessary to do treatment using the White Test or also known as robust standard errors (Gujarati & Porter, 2009).

Table 8.
Autocorrelation Test Results

Durbin-Watson d-statistics (8,700)	0.5439
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Source: data processed by STATA, 2022

The autocorrelation test for this study used the Durbin-Watson test. The results of the Durbin-Watson test can be seen in Table 10. Through the Durbin-Watson table calculations, it is known that the lower limit (dL) is 1.864 and the upper limit (dU) is 1.887. This value is then compared with the d value obtained, which is 0.5439, which means it is greater than 0, but still smaller than the lower limit of 1.864. Thus, this study shows a symptom of autocorrelation with the condition that the value of d is greater than 0 and less than the limit value ($0 < d < dL$). In dealing with the symptoms of autocorrelation, a treatment by using the clustered at firm level method is carried out.

Hypothesis 1 Test Results

The results of testing the hypothesis 1 can be seen in Table 11. The results of data processed with regression shows that the probability value is below the significance level of 0.05 or 5%, thus this study states that the first hypothesis is fully accepted because the efficiency of Intellectual Capital as measured by the VAIC model has a positive and significant impact on the company's performance which consists of financial performance as proxied as ROA and ROE and market performance as proxied as TQ. In the ROA model, the results of this study are in line with the research conducted by Chairunissa & Dewi (2015), Wijayani (2017), Sardo et al. (2018), Smriti & Das (2018), and Lubis & Ovami (2020) who found that Intellectual Capital had a positive and significant effect on ROA. On the contrary, there are studies that are not in line with this study, such as research conducted by Lestari (2017) which states that Intellectual Capital does not have any significant effect on ROA. Thus, it can be said that non-financial companies in Indonesia in the period of 2015 to 2019 already have a good ability to use intellectual capital efficiently. Thus, a good use of intellectual capital as one of the company's resources is able to increase the use of assets in creating net income as indicated by the ROA ratio.

Variable	ROA Model		ROE Model		TQ Model	
	Coef.	t - Statistic (P > t)	Coef.	t - Statistic (P > t)	Coef.	t - Statistic (P > t)

ICE	0.0111	5.49*** (0.0000)	0.0330	5.51*** (0.0000)	0.0422	2.33** (0.0220)
SIZE	0.0076	0.91 (0.3620)	0.0304	0.85 (0.3990)	-0.6414	-4.56*** (0.0000)
AGE	-0.0554	-1.68* (0.0940)	-0.1410	-1.11 (0.2700)	-0.6285	-0.93 (0.3530)
LEV	-0.0372	-1.46 (0.1470)	-0.3467	-2.69*** (0.0080)	1.7040	3.88*** (0.0000)
_cons	0.0978	0.95 (0.3450)	0.1369	0.31 (0.7550)	12.8418	4.38*** (0.0000)
R-square	0.5030		0.3125		0.0808	
F - statistic (Prob > F)	16.48*** (0.000)		11.44*** (0.000)		8.02*** (0.000)	

Table 9.
Results of
Testing the
Hypothesis 1

Description: The regression test used a fixed effect (FE) model with a robust standard error clustered at firm level technique. The value in the Coef. column is the coefficient value of each variable, while the next column is the t statistic value with the probability value (p-value) in brackets. The symbol is a sign of significance at the *10% level, **5%, and ***1%.

Source: data processed by STATA, 2022

Based on the results shown by the ROE model, this study is in line with the research of [Wijayani \(2017\)](#) and [Lubis & Ovami \(2020\)](#) which show that Intellectual Capital has a significant positive effect on ROE. Meanwhile, the research conducted by [Lestari \(2017\)](#) produced different results, namely Intellectual Capital did not have any significant effect on ROE. According to [Chen, Bontis, Cheng and Hwang \(2005\)](#), Intellectual Capital is a resource that can increase the company's competitive advantage so that it can contribute to the company's financial performance. In this case, intellectual capital is considered to play an important role in increasing the company value and financial performance. When the company is able to manage, use, and develop its intellectual capital, the Return on Assets and Return on Equity owned by the company will also increase. This is evidenced by the results of this study which show that the efficient use of intellectual capital in Indonesia is able to improve the company's performance.

The regression results for testing the first hypothesis in Table 11 also show that Intellectual Capital has a positive and significant effect on TQ, as previously described. The results of this study are in line with the research of [Smriti & Das \(2018\)](#) and [Waikabu & Hariadi \(2021\)](#) which state that there is a positive and significant influence between intellectual capital and market performance as a proxy for TQ. However, there are studies that are not in line with this research, such as the study conducted by [Chairunissa & Dewi \(2015\)](#) stating that Intellectual Capital does not have any significant effect on TQ for companies on the IDX in 2010-2012. Thus, the results of this research on the TQ model show that the efficient use of intellectual capital can have a positive impact not only on the company's performance, but also on the company's market performance.

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In addition, the research results support the stakeholder theory and resource based view theory which state that companies that can manage resources effectively and efficiently can create sustainable value and competitive advantage, thus companies can improve their

performance for the benefit of their stakeholders. This is reflected in the significant positive relationship between ICE and ROA, ROE, and TQ, where an increase in ICE has an impact on increasing the company performance. Thus, the results of this study indicate that intellectual capital functions as a company's wealth creation resource that is capable of encouraging changes in management, culture, and organization within the company to achieve added value for the company, so that it can affect the company's performance (Riahi-Belkaoui, 2003). Therefore, it can also be concluded that the measurement of intellectual capital using the VAIC method can be used as an assessment for stakeholders to determine the efficiency of value creation that can be generated by intellectual capital. This is because the research results are in accordance with the research of Pulic (2000), the creator of the VAIC model, whose research explains that a company can achieve maximum results if management can manage resources to create value for the company. A higher ICE means better management has utilized the company's potential. Employee role, represented by HCE, company value, represented by SCE, and physical and financial capital, represented by CEE, have created value to maximize company performance.

Hypothesis 2 Test Results

Testing hypothesis 2 relates to testing the moderating effect of board characteristics through the proxies of board education level, board size, and board gender composition in influencing the relationship of intellectual capital efficiency (ICE) on firm performance (ROA, ROE, and TQ). In addition, this study also uses the method of Sharma et al. (1981) to determine the moderating nature of each moderating variable. The moderation trait grouping method by Sharma et al. (1981) is as follows:

Variable	ROA Model		ROE Model		TQ Model	
	Coef.	t - Statistics (P > t)	Coef.	t - Statistics (P > t)	Coef.	t - Statistics (P > t)
ICE	0.0122	6.81*** (0.0000)	0.0368	5.35*** (0.0000)	0.0587	3.55*** (0.0000)
EDLEVEL	-0.0005	-0.86 (0.3940)	-0.001734	-0.61 (0.5430)	0.005	0.27 (0.7910)
ICE* EDLEVEL	0.0079	1.89* (0.0610)	0.0294	1.63 (0.1600)	0.1253	3.43*** (0.0010)
SIZE	0.0093	1.10 (0.2720)	0.0364	1.01 (0.3150)	-0.6207	-4.48*** (0.0000)
AGE	-0.0574	-1.81* (0.0730)	-0.1490	-1.17 (0.2440)	-0.6741	-0.99 (0.3250)
LEV	-0.0376	-1.66* (0.0990)	-0.3491	-2.91*** (0.0040)	1.6641	4.03*** (0.0000)
_cons	0.0849	0.87 (0.3880)	0.0879	0.21 (0.8360)	12.6048	4.34*** (0.0000)
R-square		0.5326		0.3352		0.0914
F - statistics		13.61*** (0.000)		11.37*** (0.000)		7.01*** (0.000)

Table 10.
Interaction
Moderation
Test Results on
Board
Education
Level Variables

(Prob > F)

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Description: The interaction moderation test used a fixed effect (FE) model with a robust standard error clustered at firm level technique. The value in the Coef. column is the coefficient value of each variable, while the next column is the t statistic value with the probability value (p-value) in brackets. The symbol is a sign of significance at the *10% level, **5%, and ***1%.

Source: data processed by STATA, 2022

Table 12 shows the regression results of testing the proxy for the board education level with the symbol of EDLEVEL. This variable, when standing alone as an independent variable using model 2a, shows an insignificant effect on the company performance, as can be seen in ROA, ROE, and TQ with a significance value above 0.05. Thus, it can be concluded that the existence of a high level of education of directors in non-financial companies in Indonesia has no effect on improving the company performance. The results of this study are in line with [Putri \(2020\)](#) which found out that the education level of the directors did not affect the company's performance. However, the education level of the directors has an influence in moderating the relationship between intellectual capital and company performance as seen in the TQ ratio, so it is called a pure moderator.

The results showed that the education level of directors in non-financial companies in Indonesia in 2015 to 2019 was only able to moderate the relationship between intellectual capital and company performance on the TQ ratio and had no effect on the ROA and ROE ratios. Thus, H2a is not fully accepted because board characteristics through board education level proxies are only able to strengthen the relationship between ICE and TQ. In the TQ model, it can be seen in the results of the study that the coefficient generated on the interaction of intellectual capital (ICE) on the EDLEVEL variable is positive 0.1253 with a very significant probability of 0.0010. Thus, the results of this study are not fully in line with the research of [A. M. Hamdan et al. \(2017\)](#) which explains that governance significantly strengthens the performance of intellectual capital on company performance which includes ROA, ROE, and TQ. The results of this study are only in line with the research of [A. M. Hamdan et al. \(2017\)](#) on the TQ model.

The results also show that non-financial companies in Indonesia listed on the Indonesia Stock Exchange already have good governance in terms of their influence on intellectual capital performance from 2015 to 2019 through managing the education level of the directors. This is because the various educational levels of directors are able to strengthen the relationship between intellectual capital regulation and the improvement of market performance or TQ. In the ROA and ROE models, the results of this study are in line with the other two studies, namely [Al-Musali & Ku Ismail \(2015\)](#) and [Chairunissa & Dewi \(2015\)](#) which explain that the governance and the education level of the board of directors are still not able to influence the performance of intellectual capital on the company performance.

The existence of broad insight can make directors have full awareness of the importance of managing intellectual capital which is an intangible resource in the company ([Hambrick & Mason, 1984](#)). Thus, the nature of intellectual capital and its usefulness can be known, so that it can be used optimally to improve company performance. The results of the study which show that the education level of the directors is able to influence the relationship between the efficient use of intellectual capital and TQ performance is also in line with the stakeholder theory. This is shown by the board of directors who is able to use different

insights to develop quite effective strategies to maximize the stakeholder value through the use of intellectual capital in the company.

The results also support the upper echelon theory which states that the characteristics of directors need to be known considering that the company's performance is reflected by the performance of its top management. This study shows that various educational levels of directors are able to strengthen the relationship of the efficiency of intellectual capital management on company performance. Although this level of education has no effect on the ROA and ROE models, it is known that the presence of the education level of directors is quite influential on the relationship between intellectual capital and company's TQ.

Variable	ROA Model		ROE Model		TQ Model	
	Coef.	t- Statistics (P > t)	Coef.	t - Statistics (P > t)	Coef.	t - Statistics (P > t)
ICE	0.0119	6.58*** (0.000)	0.0359	5.87*** (0.000)	0.0513	3.42*** (0.0010)
BSIZE	-0.001	-0.87 (0.3850)	-0.0079	-1.09 (0.2790)	-0.04	-1.15 (0.2540)
ICE*BSIZE	0.0083	2.10** (0.0380)	0.0329	1.74* (0.0840)	0.1084	2.90*** (0.0040)
SIZE	0.0070	0.87 (0.3850)	0.0279	0.80 (0.4260)	-0.6499	-4.73*** (0.0000)
AGE	-0.0509	-1.60 (0.1120)	-0.1220	-0.96 (0.3360)	-0.5574	-0.82 (0.4150)
LEV	-0.0368	-1.68* (0.0960)	-0.3446	-2.95*** (0.0040)	1.7143	4.14*** (0.0000)
_cons	0.0985	1.01 (0.3140)	0.1469	0.35 (0.7250)	12.9261	4.46*** (0.0000)
R-square	0.5329		0.3400		0.0893	
F - statistics (Prob > F)	13.94*** (0.000)		11.83*** (0.000)		6.96*** (0.000)	

Table 11.
Interaction
Moderation
Test Results on
Board Size
Variables

Source: data processed by STATA, 2022

Furthermore, the second moderating variable is the board size with the symbol of BSIZE. Table 13 shows that the BSIZE variable as an independent variable tested with model 2a has an insignificant effect on the company performance, as seen in the ratio of ROA, ROE, and TQ. However, the BSIZE variable has a significant role when testing the interaction moderation with intellectual capital. The results of the moderation test show that the size of the board of directors as a part of the characteristics of the board of directors is able to strengthen the relationship between intellectual capital and company performance through ROA and TQ ratios, and it has the nature of being a pure moderator. Thus, H2b in this study is not fully accepted because the characteristics of the board of directors with the board size proxy are only proven to strengthen the relationship between intellectual capital and company performance through ROA and TQ, but there is no significant relationship on ROE performance.

The results of this study are also not completely in line with the research of [A. M. Hamdan et al. \(2017\)](#) because in this study, the characteristics of the board of directors through the board size proxy are still not able to moderate the relationship between intellectual capital and the company's ROE. The results which show that the size of the board of directors is able to strengthen the relationship between intellectual capital and ROA and TQ indicate that the company has an advantage through the presence of a good and appropriate structure of the board of directors. With an adequate structure of the board of directors, information circulation runs smoothly without any miscommunication in operational activities ([Dalwai & Mohammadi, 2020](#)). Therefore, the use of resources in the company becomes optimal, and the company's performance will also increase, as evidenced by the research results. The size of the board of directors can affect the level of efficiency in the use of intellectual capital, as shown by the research ([Dalwai & Mohammadi, 2020](#)).

The composition of the board of directors that is suitable for a company will make resource management better; thus, it is in line with stakeholder theory which states that the company's management will prioritize the interests of the stakeholders. Through the results of the study, it is known that the size of the board of directors has an influence on the relationship between intellectual capital management and ROA and TQ. Thus, the size of the board of directors serving in a company is not a problem because the coordination provided can be said to be quite good through good net income exposure, as seen from the ROA ratio, and also a positive public view, as seen from the TQ ratio.

Variable	ROA Model		ROE Model		TQ Model	
	Coef.	t- Statistics (P > t)	Coef.	t - Statistics (P > t)	Coef.	t - Statistics (P > t)
ICE	0.0113	5.95*** (0.0000)	0.0335	5.41*** (0.0000)	0.0473	2.49** (0.0140)
GNDR	0.0293	0.26 (0.795)	-0.1315	-0.23 (0.817)	-0.2864	-0.61 (0.540)
ICE*GNDR	0.0029	0.76 (0.4500)	0.0080	0.62 (0.5360)	0.0813	0.96 (0.3370)
SIZE	0.0057	0.72 (0.4760)	0.0248	0.69 (0.4930)	-0.6991	-4.29*** (0.0000)
AGE	-0.0510	-1.73* (0.0860)	-0.1280	-1.01 (0.3150)	-0.4919	-0.76 (0.4460)
LEV	-0.0351	-1.40 (0.1630)	-0.3416	-2.64*** (0.0090)	1.7492	3.85*** (0.0000)
_cons	0.1096	1.02 (0.3110)	0.1734	0.40 (0.6910)	13.2423	4.35*** (0.0000)
R-square	0.5060		0.3138		0.0849	
F - statistics (Prob > F)	13.54*** (0.000)		8.84*** (0.000)		5.76*** (0.000)	

Table 12.
Interaction
Moderation
Test Results on
Board Gender
Composition
Variables

14.3

The last proxy for the characteristics of the board of directors is the gender composition of the board of directors, which is symbolized by GNDR. This gender composition can also be said as the percentage of women in the composition of the board of directors. Based on the

results of the study, it is known that the GNDR variable as an independent variable tested using model 2a has an insignificant effect on all financial performance proxies used, including ROA, ROE, and TQ. This indicates that the presence or absence of female directors in non-financial companies in Indonesia does not affect the company's performance.

The results of the moderation test using model 2b show that the characteristics of the board of directors through the proxy of gender composition are not able to strengthen the relationship between intellectual capital and company performance. Thus, the results of this study are in line with the research of [Chairunissa & Dewi \(2015\)](#) which states that governance is not able to moderate the relationship between intellectual capital and company performance. This shows that the ideas, perceptions, innovations, and decisions of the male and female directors do not affect the management of resources in the company or the company's performance. Likewise, H2c is completely rejected which indicates that the characteristics of the board of directors through the proxy of the board gender composition are not able to strengthen the relationship of intellectual capital and company performance. This proxy also has the properties of being as a moderator homologiser because it is not significant as an independent variable or a moderating variable.

The results of this study reject the research results of [Nadeem, Farooq and Ahmed \(2019\)](#) which states that companies should appoint more women on the board of directors because they have a major influence on the efficient use of intellectual capital. The rejection is supported by research results which show that the presence of female directors has an entirely insignificant effect on the efficiency of intellectual capital management and company performance. Through the proxy of gender composition, the upper echelon theory is also not supported. According to [Nadeem et al. \(2019\)](#), the upper echelon theory states that gender composition can increase innovation through effective strategies. However, the results of this study indicate that this gender composition is not at all able to affect the performance of the directors in terms of managing resources (intellectual capital) to improve company performance.

CONCLUSION

Based on the results of the first hypothesis test that has been carried out, it is proven that the efficiency of intellectual capital (ICE) has a positive and significant effect on company performance. Furthermore, the results of the second hypothesis regarding the moderating effect of the characteristics of the board of directors on the relationship between intellectual capital efficiency on firm performance show that the second hypothesis was not fully accepted because the characteristics of the board of directors were not fully able to strengthen the relationship between intellectual capital and firm performance.

The results of this study offer various implications for several parties, especially the management, to get a lot of knowledge regarding the importance of managing intellectual capital in the company which can be seen in the results of this research. In addition, through the research results related to the moderating effect of the characteristics of the board of directors, companies can review a good arrangement of the board of directors, especially on the level of education and size of the board of directors. Investors can also use the results of this study to assess how well the company manages the governance and regulation of the selection of the board of directors in the company because it is known that the characteristics of the board of directors have insignificant influence in determining the strategy of resource management.

One of the limitations in this research is the limited data related to employee costs which are needed to measure one component of intellectual capital, namely the human resource component. Companies in Indonesia that are listed on the IDX do not fully disclose the costs incurred for employees in detail in their annual reports, such as cost of training. Another limitation of this study is it is not able to cover and provide arguments for other factors that can influence the decision making of the board of directors because it only examines the board of directors through characteristics.

Based on the results of this research, it is suggested that further researchers conduct an analysis related to the influence of intellectual capital on company performance by moderating the characteristics of the board of directors in specific industries that require intellectual capital or have high and significant intellectual capital on company performance, such as the property and real estate industry which are found to have a high average ICE compared to other industries. This also helps further research to obtain more adequate and specific data, especially regarding training costs which are presented in the company's annual report. Further research can also use more in-depth measurements of the board of directors than only examining the characteristics of the board of directors, such as the work experience of the board of directors, policies applicable in the company, or other measurements of the board of directors that can show in detail how the board of directors is able to moderate the relationship between intellectual capital and company performance.

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