The Moderating Role of Sustainability Disclosure on the Relationship between Intellectual Capital and Firm Performance

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Abstract: - The purposes of this research were to study the relationship between intellectual capital and firm performance, and the relationship between intellectual capital and firm performance which was moderated by sustainability disclosure. The accounting firm's performance was measured by return on assets (ROA), and the market firm's performance was measured by Tobin's Q. Sustainability data were collected according to GRI Standards. The intellectual capital was measured by value-added intellectual capital (VAIC). The sample included 185 firms from three industries; agriculture and food, technology, and service industry listed on the Stock Exchange of Thailand from 2018 to 2020. The results showed that intellectual capital had a positive relationship with accounting performance and market performance. When the moderating role of sustainability disclosure was examined, it was found that sustainability disclosure positively moderated the relationship of value-added intellectual capital (VAIC^{TM}) on market performance (Tobin's Q) at a significance level of .05. The results showed that intellectual capital influenced firm performance and enhanced firm efficiency, particularly when firms paid attention to sustainability disclosure.

Key-Words: - Intellectual Capital, Sustainability Disclosure, Firm Performance, GRI standards, Value Added Intellectual Capital, Return on Assets, Tobin's Q.

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1 Introduction

Competition has forced business organizations nowadays to adapt and develop continuously. To do so requires the internal and external potential of the organization. Such potential is called 'capital', which can be in the form of industrial capital, including labor, raw materials, tools, machines, processes, and methods created by monetary funds. However, intellectual capital (IC) is a form of capital that does not require any monetary funds. Intellectual capital with its great potential can change and develop business endlessly, [1], [2]. It is also an important factor that provides competitive advantages to organizations. Thus, it is essential to use intellectual capital that exists in their personnel to create added value for the organization. The idea of intellectual capital was introduced during the years 1959 - 1997 by a group of researchers. Based on intellectual capital, economists have developed new concepts of business strategy that emphasize resource efficiency by considering the utilization from the use of existing assets, acquisition of expertise, knowledge management, and learning. Edvinsson and Malone, [3], suggested that the development of intellectual capital is the outcome of human capital and structural capital. In other words, experience in applying organizational technology, customer relationship, and professional skills help an organization gain competitive advantages that other competitors cannot easily imitate, [4], [5].

Modern business organization management has a concept that requires sustainable growth and profits. However, more profits may not be enough for growth. Organizations must maintain a balance of assets, sales, and rate of return to avoid future financial problems. Thus, intellectual capital, if constantly developed, is one of the assets that can add value and maximize benefits to the organization. While attracting investors, can lead to organizational growth and survival, [6].

Before making an investment decision, investors need disclosed information about the

company, which includes financial reports and non-financial reports. [7], surveyed institutional investors around the world in 2014 and found that 75 % of the investors emphasized the importance of non-financial reports as shown in the corporate annual reports, integrated reports (IR), corporate social responsibility (CSR), sustainability reports, and information about the environment, society and corporate governance (ESG), [8]. Disclosure of information related to intellectual capital management in sustainability reports is considered a positive signal to investors and those who are interested in investing in companies with high intellectual capital management. An increase in investment also affects the market price of company stock and value. Moreover, human capital and capital relationship contribute significantly to sustainability disclosure practices, [9], [10]. The importance of human resource development can lead to outstanding abilities that other competitors cannot imitate according to the resource-based view theory, [4]. In addition, Section 400 of the sustainability disclosure criteria of the GRI Standard established the criteria and guidelines for disclosure regarding employee benefits, the extent of training, and welfare issues, [11].

Performance assessment is required in running the business since it reflects firm performance by indicating corporate growth. High-performing companies have more opportunities to invest in research and development to create new products and services. Companies listed on the Stock Exchange of Thailand are required to disclose information regarding their purchases, sales, market surveillance, and member supervision. Disclosure of information to investors ensures transparency and reliability, which are essential factors to consider before making an investment decision.

In Thailand, most firms voluntarily disclose their sustainability. The Global Reporting Initiative (GRI standard), which is uncomplicated and suitable for all sizes of firms to apply, is used as an indicator to measure this. Therefore, it is obvious that firms nowadays seem to pay more attention to their stakeholders' concerns, annual report analysis for decision-making, contributions to society, and related issues. Furthermore, the GRI standard can serve as a guideline to collect the sustainability data following form 56-1 issued by the Securities and Exchange Commission (Thailand). Currently, 75 registered firms have reported their sustainability based on the GRI standard. The GRI standard is not only a report of communication but can also function as a checklist that assists firms to move forwards in the long run, [12].

In the past, if firms disclosed their sustainability report, for being approved by the external committee, it was because the firms wished to show their responsibility and carefulness in collecting data to appear more trustful. The study combines two theories, the Stakeholder theory, and the Resource-based view theory, to prove the importance of a firm's resources which enlarge firm performance.

Currently, the Stock Exchange of Thailand (SET) promotes and supports more disclosure of non-monetary information, especially the sustainability report according to the 56-1 form of the SEC and the GRI international sustainability disclosure framework, [12], but it is still voluntary disclosure. In addition, intellectual capital is an important intangible asset of the business to drive the organization. Previous research of intellectual capital and sustainability disclosure and firm performance found their relationship to vary between sometimes positive, or negative, or no relationship existed. Consequently, this study aims to investigate the relationship between intellectual capital on firm performance moderated by sustainability disclosure.

There are two objectives of this study: (1) to study the relationship between intellectual capital (measured by Value Added Intellectual Coefficient (VAICT™)) and firm performance (measured by Return on Assets (ROA) and Tobin's Q), and (2) to study the relationship between intellectual capital and firm performance moderated by sustainability disclosure (following the guidance of the GRI Standards).

The results of this study would help companies to find strategies and solutions while creating competitive advantages by utilizing intangible assets, such as intellectual capital and sustainability management. This research helps a firm to foresee the competency that may be needed to develop for future success as well as to build agreement. Decision-makers or executives who pursue the competency judgment procedure may realize the important tendency. Firms can use this to help increase their competitive advantage leading to higher performance as well as to explore how these relationships can be sustained in the long run.

This encourages firms to disclose their sustainability focusing on the quality of the data. Stakeholders are also able to evaluate the firm's actual value. Furthermore, this also assists investors in accessing the firm's profitability, wealth, and value which helps the investors to forecast the viability and future growth more accurately.

2 Literature Review

The concepts, theories, and results of previous studies relating to intellectual capital, sustainability disclosure, and firm performance were collected and studied to propose the conceptual framework and method of this study.

2.1 Concepts of Intellectual Capital

Intellectual capital, or IC, is a set of knowledge within the organization. There are several terms for intellectual capital, such as intangible assets, and intellectual property that help operate the organization efficiently, [13], generate a reputation and support the business to achieve sustainable competition, [14]. In summary, intellectual capital refers to intangible assets within the organizational context derived from personnel and resources, which will eventually effect the creation of value for the organization. Intellectual capital can be divided into two major elements, [2], [15] as follows:

Human capital: This is an important resource of the organization. If an organization has personnel that can combine knowledge, skills, and experiences, it can lead to more competitive advantages, [13]. In addition, knowledgeable employees with high qualifications can lead to better sustainability, [11], [16].

Structural capital: This is a component of intellectual capital created by organizations to transform human capital into tangible capital, such as organizing workflow systems, technology, and databases to support the work of personnel and achieve the desired results. This type of capital, such as policies and culture, remains in the organization even though the employees have left.

Thus, well-structured capital must allow knowledge sharing for business sustainability, [11], [16], [17].

[18], found that the utilization of capital employed is also an element that combines physical capital and financial capital. Since intellectual capital is an intangible resource that generates income or added value directly to the business, it is necessary to rely on tangible assets from the investment of the business to generate income or added value.

2.1.1 Intellectual Capital Valuation

Due to the importance of intellectual capital in business and accounting, several businesses are interested in measuring the value of intellectual capital. Thus, a variety of valuation concepts have been developed with advantages and disadvantages. However, the main problem is that external data sources are qualitatively requiring judgment, which is difficult to measure and may have some discrepancies. One popular method is Value Added Intellectual Capital or VAIC, developed by, [19]. This method uses the perspective of stakeholders to measure the efficiency of three elements of intellectual capital: physical and financial capital, human capital, and structural capital. The advantage of this method is that it is based on quantitative information from publicly available financial reports with no restriction on data access. With its easy calculations and standardized formats, it can be used to compare businesses based on industry and country. If intellectual capital can be reliably measured, it leads to a study on the relationship between intellectual capital and firm performance in several countries, [9], [15], [20].

2.2 Theories

2.2.1 Resource-based View Theory

Concerning the issue of whether intellectual capital and firm performance are correlated or not, the resource-based view theory suggests that the ability to create value for a company does not arise from the movement of external factors, but from the processes within the company. According to [4], the nature of the valuable resource that creates firm value is scarce and cannot be imitated or replaced. This kind of resource can lead to competitive advantages, value, and sustainability. Intellectual capital has the aforementioned characteristics. If human capital, structural capital, and physical capital are combined in a process, it can lead to good firm performance, [10], [11], [21], [22].

2.2.2 Legitimacy Theory

Legitimacy theory refers to legitimate action, [23], based on the concept of the social contract. In other words, companies have to meet the expectations of the community and take steps to ensure that such activities are lawful. It is similar to a social contract between businesses and society by utilizing natural resources and human resources for business operations. Since companies are bound by the norms of society, it is essential that they voluntarily report their activities.

Thus, legitimacy theory is relevant to reporting corporate information regarding intellectual capital. Even though there are no criteria for such disclosure, it still leads to success, [1], [21], [24], [25].

2.2.3 Stakeholder Theory

Stakeholder theory was described by [26], as a conceptual framework, which presented a positive

view of the management in favor of corporate social responsibility. [27], advocated that management must please stakeholders who influence the firm performance, such as employees, customers, vendors, and the local community. In other words, stakeholders are individuals or groups of people that may affect the success of the company. Reporting those activities to stakeholders is similar to defining corporate responsibility and revealing information regarding intellectual, social, and environmental capital in addition to reporting economic and financial performance, which is beyond the requirements. Thus, stakeholder theory involves the method of implementing analyzed content, which is the most effective way for organizations to communicate with stakeholders, [1], [21], [24], [25], [28], [29].

The aforementioned three theories were used to explain the relationship between intellectual capital, sustainability disclosure, and firm performance.

2.3 Sustainability Disclosure (SD)

The trend of sustainable development has pushed all sectors to pay attention to the development of operations for sustainability, including the economic, social, and environmental aspects. Several countries have agreed to use it as a framework for development at the organizational level and the national level.

The global reporting initiative sustainability guidelines (GRI guidelines) defined the term sustainability as "the practice of measuring, disclosing and being accountable to internal and external stakeholders for organizational performance towards the goal of sustainable development". In other words, it refers to the accountability to internal and external stakeholders for sustainable development goals. Sustainability disclosure can be applied and referenced according to the generally accepted international reporting framework, [30], which is a guideline for corporate sustainability information disclosure from economic, social, and environmental perspectives, [31]. The sustainability report sets out the facts of the operations that positively or negatively affect the economy, society, and the environment. Thus, it is necessary to report results that reflect those effects, [32]. Since the companies listed on the Stock Exchange of Thailand (SET) are an important driving force of the country's economy, the SET encourages them to operate under the principles of sustainability to meet the needs of investors. Moreover, sustainability reports are similar to a tool in the business sector in the form of social communication since they can be used as another form of corporate publicity for marketing promotion, which affects the credibility and image of the organization, [51]. It is beneficial to various groups of people, such as companies that plan to create sustainability while reducing ongoing operational problems and encouraging employees to work for an organization that values them with respect and equality based on human rights, [8].

2.4 Related Research

The importance of intellectual capital led this study to examine how to evaluate, manage, and utilize intellectual capital to create competitive advantages and maximize the value for the organization. Thus, this study was conducted in an attempt to provide empirical evidence of a relationship between cognitive capital and firm performance with different measures and reveal the results regarding how the application of sustainability management disclosed through the sustainability report created or increased the efficiency of the business.

2.4.1 The Relationship between Intellectual Capital and Firm Performance

Intellectual capital is considered to be an important resource that generates profits for organizations and affects financial performance. According to Barney's resource-based view theory, excellent intellectual capital that is available in an organization is a resource that helps manage the organization.

According to [33], intellectual capital affects the financial viability of firms as measured by ROA, which reflects that superior intellectual capital possessed by firms is an important resource that improves overall management. This is consistent with the study of [15], who found that intellectual capital measured by a value-added intellectual coefficient (VAIC) had a positive relationship with accounting performance measured by ROA and ROE. Moreover, intellectual capital data was positively related to firm value and benefits for market stakeholders who use intellectual capital information to make decisions. Disclosure of intellectual capital reduces information inequality among shareholders by providing investors with more information for investment, [13], [34]. This is consistent with study, [35], who found that voluntary disclosure of human capital data in New Zealand had a positive relationship with firm value. When the relationship between the intellectual capital of the previous year measured by a value-added intellectual coefficient (VAIC) and firm performance of the current year measured by employee productivity was compared, it revealed

that the previous year's intellectual capital continuously helped add value to the business and affected future performance, [20]. [10], stated that intellectual capital as measured by VAIC increased the value and affected the added value of market returns as measured by Tobin's Q. This is consistent with the resource-based view theory. Furthermore, competitive advantage from resources, including intellectual capital in the forms of human capital, physical capital, and structural capital should be considered by companies, [36]. Additionally, human resources are the key to achieving the goals and leading to competitive advantages that add value to differentiate from market competitors, [16], [21], [37], [38]. According to the results of the above studies, it was mostly found that the relationship was positive in the same direction. The positive influence between intellectual capital and business efficiency contributes to increasing the ability of the business to create firm value caused by internal factors, not external factors. This is consistent with the resource-based theory that indicates that a scarce resource is valuable to an organization, and cannot be imitated. This resource can also create competitive advantages, [9], [15], [33], [39].

However, some studies found no relationship between them. For instance, [20], found that the value-added intellectual coefficient (VAIC) in the previous year had a significant negative relationship with ROA and RG. In addition, [15], found that the human capital component had a negative relationship with accounting and marketing performance since human capital measured by employee-related expenses could not generate returns for the business within one year. Moreover, intellectual capital was not related to marketing performance measured by Tobin's Q. The reason is that even the high amount of expenses spent on intellectual capital does not reflect added value from an investor's perspective. This concurs with, [28], who found no relationship between intellectual capital and firm value as measured by Tobin's Q. This reflects the inability of the company to manage the three components of intellectual capital together and to increase the level of operational capacity to manage the three components of intellectual capital to add firm value. Likewise, [2], found that intellectual capital performance as measured by VAIC had no relationship with firm performance as measured by ROA, ROE, and NPM. This might be due to the time that the study was conducted and other factors that might influence the data used in the study, such as expenses related to employees who might be affected by the economic situation and the COVID-19 pandemic. Thus, the hypothesis was developed as follows:

H 1: Intellectual capital (VAIC) has a positive relationship with firm performance.

2.4.2 The Relationship between Sustainability Reporting and Firm Performance

Corporate sustainability management and performance are interrelated in many ways. Profitability increases as companies disclose their sustainability management on social and environmental issues. [40], found a relationship between sustainability performance and financial and market performance that contributed to driving innovation and competitive advantage, [41]. Additionally, [51], found that reporting sustainability according to the criteria of GRI-G4 in the aspect of the economy had a positive relationship with the market value measured by Tobin's Q. Disclosure of economic data is one of the requirements of the Stock Exchange of Thailand. The economic report is an important factor affecting investment. This is in line with, [10], who found that reporting on the issue of intellectual capital in sustainability reports boosted enterprise value as measured by Tobin's Q due to the clarity and transparency, which affected the profitability of the business. [25], [28], [29], revealed that the level of ESG affected the firm performance of the companies that disclosed their ESG to show good relationships with their employees since it could attract talented people to work there. Reporting could fulfill the stakeholders' needs and affects firm performance. This follows the legitimacy theory and stakeholder theory. In contrast, [56], found the relationship between sustainability disclosure in the opposite direction. This might be because profitability indicators were thought to demonstrate the success of the company, and non-financial information may not have been accorded sufficient importance. However, according to the legitimacy theory, highly profitable companies will choose to report only their success numbers. In the case of low profits, only positive information that reflects good management would be reported.

However, several studies found no relationship between financial performance and sustainability disclosures, or a very low and unclear relationship was found. In other words, ESG scores might not reflect non-financial data sufficiently. It was still difficult to comprehend, [42], [43]. This is consistent with, [44], who suggested that a sustainability report did not affect firm performance, the sustainability disclosure or social responsibility did not reflect the benefits to management and

shareholders, and the period of reporting and collection of performance data was short-term. Thus, no effect was found. In addition, [24], found no clear results during the release of the sustainability report and firm performance as measured by Tobin's Q.

Based on the review of the literature, sustainable development drives various sectors to pay more attention to sustainability. Therefore, the stock exchange has been trying to encourage companies to disclose sustainability information, as well as the negative and positive effects on the economy, society, and environment. Financial information alone may not be sufficient to meet the needs of investors and customers, as well as social and relevant stakeholders.

2.4.3 The Effect of Intellectual Capital on Firm Performance Moderated by Sustainability Disclosure

Intellectual capital information helps reduce the gap between management and shareholders. [9], found a similar relationship between intellectual capital and firm performance as measured by ROA when sustainability disclosure was moderated. In addition, the criteria for preparing sustainability reports of the GRI Standard had indicators that businesses could use as guidelines for preparing sustainability reports or use in planning policies on topics related to human rights, employee management, employee benefits, frequency of training, and welfare issues, [11]. Standards for sustainability reports, such as GRI, contribute to the disclosure of more detailed sustainability management information. Companies that pay great attention to the management of stakeholder groups will try to build credibility and image with intangible asset management reporting, such as intellectual capital management, and knowledge, which are important to create a sustainable competitive advantage, [45], [46].

[47], stated that human capital, which is a key component in intellectual capital, plays an important role in sustainability disclosure. [22], found that financial services firms with intellectual capital in the form of skilled human capital in sustainability disclosure were able to prepare a sustainability report according to the reporting criteria of GRI, together with the fact that the business can maintain the components of intellectual capital: human capital, structural capital, and capital employed. This is in line with the resource-based view theory that management ability, intellectual capital, and knowledge management were the key to reporting sustainability in developing countries. This is in line with, [11], who found that the level of intellectual capital contributes to supporting report preparation, and companies with high intellectual capital would have the ability to produce sustainability reports under the internationally recognized GRI standard. Moreover, according to stakeholder theory, companies are expected to contribute relevant information about their stakeholder activities, and investors tend to consider reports other than financial reporting.

According to the aforementioned theoretical concepts, it can be seen that intellectual capital and sustainability disclosure are involved with firm performance. Companies are required to disclose information following stakeholder theory and legitimacy theory based on legal norms and expectations of stakeholders. In addition, resources such as intellectual capital must be preserved to gain a competitive advantage over competitors according to the resource-based view theory, and increase firm performance.

From the sources and the importance of problems, it appears that intellectual capital becomes an intangible asset, which is necessary for all firms. Furthermore, it is found that intellectual capital influences the market value or stock price as well. However, there are very few studies investigating the relationship between intellectual capital aspects or sustainability disclosure that affect firm performance in Thailand.

To conduct this study, besides using a working paper for the quality checklists of sustainability disclosure to collect the data, the available data from the disclosed reports of the company were collected. The obtained data were gathered for content analysis. However, this study aimed to measure the quality of the disclosure of the sustainability of the business, which reflects clarity and transparency. Thus, the hypothesis was developed as follows:

H2: Sustainability disclosure moderates the relationship between intellectual capital and firm performance.

3 Research Methodology

3.1 Samples

The samples used in this study included listed companies in the Stock Exchange of Thailand in the agriculture and food industry, technology industry, and service industry. [48], found that the business & public service industry and the electronic component industry were two of the five industries with the most intangible assets. [6], also found that the sustainable growth rate of companies in the

agriculture and food industry had the highest average, followed by the technology industry, and service industry. The technology industry plays a part in driving Thailand into Industry 4.0. In the technology and information technology industry, firm performance depends on the skill of its employees, whose knowledge is part of intellectual capital and is important to the success of the organization, [1]. The data of 370 companies from 2018 to 2020 were collected from the annual financial statements disclosed in the Annual Registration Statement (Form 56-1), sustainability report, and on the official website of the company.
The number of firms in these industries is shown in Table 1 below.

Table 1. Firms sampled by industry

Industry	Firms per year	Percent
Agricultural and Food	49	26.00
Services	100	54.00
Technology	36	19.00
Total Samples	185	100.00

The final samples, after removing an outlier, were 185 firms per year consisting of 49 firms in the agricultural and food industry, 100 firms in the service industry, and 36 firms in the technology industry.

3.2 Variables and Their Proxy Measures

3.2.1 Dependent Variables

Financial performance is widely used to assess firm performance in the early stages. In the mid-1980s, market-based measures, such as Tobin's Q and the market-to-book value (MB ratio) were used. According to [49], accounting and marketing operations reflect different aspects of information. Thus, this study only measured the firm performance based on accounting and marketing aspects to obtain the most realistic operating results of the business, [15], by measuring firm performance in the accounting aspect with the return on asset (ROA) and using Tobin's Q to measure marketing performance to reflect intellectual capital management. This shows the continuous increase in firm value which would affect future operations, [20], [37]. Thus, this study used the dependent variable in year t+1 (the year 2019-2020), after year t (the previous accounting period, the year 2018-2019).

Return on assets ($\mathbf{ROA_{t+1}}$): This is one of the performance indicators of the companies listed on the stock exchange. It was widely used to measure dependent variables in the studies on the relationship between intellectual capital and firm performance, [2], [16], [25], [29], [33], [36], as well as indicators used to measure the relationship between sustainability disclosure or corporate sustainability management, [9], [24], [41].

This ratio indicated the firm efficiency in generating net accounting profit by the calculated ratio describes the terms of investment efficiency that can be used to generate a net profit. A ratio greater than 1 means the ability to produce better performance than the investment.
ROA = Net Income/Total Assets

Tobin's Q_{t+1}: This is a measure of market performance. This ratio developed by [57], divides the market value of corporate assets by the replacement price of that asset. The replacement price reflects the value of that asset which can be used to invest in other ways. If the company uses an asset whose market value does not exceed the replacement price, the company should consider using that asset to invest in other alternatives. Thus, a company with Tobin's Q value of less than 1 is unable to make efficient use of its assets, [10], [15], [24], [25], [29],
[50], [51].
Tobin′s Q_{t+1} = (Market Capitalization + Total Debt)/ Total Assets
Where Market Capitalization is the value of assets according to the market price.

3.2.2 Independent Variables

Value-added intellectual coefficient (VAIC) which has been widely used in several studies was selected and applied in this study due to its advantage of being a standardized valuation method which made it possible to use the results obtained from the study to compare industries and countries effectively. Besides being easy to calculate, this method of measuring the value of intellectual capital uses information from financial reports, which reflects the reliability of the information since it has been audited by an auditor and has become publicly available information. Thus, there were no barriers to access to the information in focus, [10], [15], [28], [36]. The measurement process can be summarized as follows:
Step 1 Calculate gross value added
$VA_t = NI_t + W_t + I_t + T_t$ where:
VA_t or Value added was measured by net profit plus the expenses shared with various groups of stakeholders.
NI_t is the net profit after tax.
W_t is expenses incurred on personnel in the organization, including salary, wages, welfare, other

benefits paid to employees, and expenses for personnel development, such as training. Due to limited access to all data, the data regarding "employee expenses" were collected from the notes to the financial statements under the heading "expenses by nature".

I_t is the interest expense, which was collected from interest expenses, including financial costs shown in the financial statements of the business.

T_t is the tax paid, which was collected from the income tax shown in the financial statements of the business.

Step 2 Calculate the value-added capital employed coefficient ($VACA_t$)

$VACA_t = VA_t / CA_t$

CA_t is capital employed or physical capital, which can be measured from physical assets + financial assets or total assets - intangible assets

Step 3 Calculate the value-added human capital coefficient ($VAHC_t$)

$VAHC_t = VA_t/HC_t$

HC_t is an investment in human capital in the form of salaries, wages, welfare, and other benefits paid to employees in the current fiscal year. The data were collected from "employee expenses" within the notes to financial statements under the heading "expenses by nature".

Step 4 Calculate value-added structural capital coefficient ($STVA_t$)

$STVA_t = SC_t/VA_t$

SC_t is structural capital, which can be measured from $VA_t – HC_t$

Step 5 Calculate the value-added intellectual coefficient ($VAIC_t$)

$VAIC_t = VAHC_t + VACA_t + STVA_t$

In summary, $VAIC_t$ is the efficiency of generating business value from the resources of the business, which consist of human capital, and structural capital, being the main components of intellectual capital. It also includes physical capital, which is traditional capital on which the company still depends or mainly relies in some countries.

3.2.3 Moderator Variables

Concerning the method of data collection sustainability disclosure (SD), from the literature review, it was found that most of the previous research brought disclosures that were internationally accepted as a disclosure criterion, [25], [29], [44], [51].

In this study, the disclosure criteria of GRI Standards, [30], with 145 indicators as a guideline for collecting data, demonstrating clarity to convey understanding, was used. The disclosure rating for each metric was as follows.

1) 1 point if the business discloses information according to the criteria of the GRI Standard indicator.
2) 1 point if, the disclosure according to No. 1, the business explains a table or a picture.
3) 1 point if, the disclosure according to No. 1, the business is guaranteed by an external agency (GRI 102: General disclosure; Reporting Practice - Disclosure 102 - 56 External assurance), [30].

The total points of each indicator are 3 points, from all 145 indicators. Therefore, the total points of all indicators are 145 points × 3 points = 435 points.

Then, summarize each firm's results. The results will be computed and adjusted into a percentage (%) which will be compared with the disclosure summarized from the total scores of each type of business of each industry being investigated in this research. Since sustainability disclosure is voluntary, certain topics are not disclosed. Hence, it cannot be concluded that the firms do not progress with or ignore certain topics.

To balance the correctness of data collecting in each type of business of each investigated industry, all several indicators used for measuring the proportion of sustainability disclosure will be statistically tested which are presented as follows. The total sustainability disclosure score categorized by industry and sector is presented in Table 2.

Table 2. Total sustainability disclosure score categorized by industry and sector

Industry	Sector	Total Sustainability Disclosure Score
Agricultural and Food	Food and Beverage	435.00
Agricultural and Food	Agriculture Business	426.00
Technology	Information and Communications Technology	432.00
Technology	Electronic Component	435.00
Service	Transportation and Logistics	426.00
Service	Media and Publications	435.00
Service	Medication	423.00
Service	Specific Services	423.00
Service	Travel and Leisure	423.00
Service	Commerce	426.00

3.2.4 Control Variables

From the literature review on the relationship between intellectual capital business performance sustainability disclosure, it was found that some independent variables influenced the dependent variables or firm performance. Thus, to control the effect of other factors that may affect the dependent variable, the control variables used in the study were as follows.

- Each industry type was determined as a dummy for use in the study.

Agro_Industry; 1 if the company is in the agricultural and food industries, 0 if the business is in other industries

Tech_Industry; 1 if the company is in the technology industry, 0 if the business is in other industries

Serv_Industry, 1 if the company is in the service industry, 0 if the business is in other industries

- Leverage ratio is accepted as one of the fundamentals for investigating firm performance and creating value. Thus, the ratio of total liabilities to total assets is used as a proxy for leverage in this study.
- Firm size is measured by the market value of assets.

3.3 Data Analysis

The research quantitatively employs multiple regression at the statistical significance level of 0.05 to analyze the relationship of independent variables, intellectual capital (the year 2018 to 2019) on independent variables and future firm performance (the year 2019 to 2020) in two types of accounting (return on asset: ROA) and marketing perspective (Tobin's Q); moderated by sustainability disclosure score. The control variables in this research are industry, leverage, firm size, and industries. The test of Normality are presented in Table 3 whereas the list of variables is presented in Table 4.

The assumptions or conditions of the cross-sectional regression analysis were examined, and it was found to conform to all of the conditions as follows.

1) The mean of the error was 0.

2) The variance of the error was constant.

According to the scatter plot diagram, it was found that most of the tolerances were distributed above and below level 0, and the distribution was narrow, regardless of Y changes in direction. Thus, it was concluded that the variance of the error was constant, and heteroscedasticity did not occur

3) The error was a normally distributed variable.

Table 3. Tests of Normality

Model test	Kolmogorov-Smirnov		
	statistic	Sig.	Distribution result
VAIC	0.011	.200*	Normal
SD	0.013	.200*	Normal
ROA	0.005	.200*	Normal
Tobin's Q	0.013	.200*	Normal
VAIC.SD	0.005	.200*	Normal

4) Test of the independent standard error with the Durbin-Watson coefficient value is between 1-3 indicating that an autocorrelation does not exist. The error values (in Table 7, Table 8) of the variables were independent, and no autocorrelation occurred, [55].

5) For all independent variables, there is no close relation to preventing multicollinearity. According to the criteria of, [54], the tolerance value must be greater than .10, and the VIF value must not be close to or exceed 10. The values shown in Table 7 and Table 8, revealed that there is no multicollinearity.

Table 4. The list of variables

Variable	Type of Variable	Description
ROA_{it+1}	the dependent variable	Return on assets for firm i in year t+1
Tobin's Q_{it+1}	the dependent variable	Tobin's Q for firm i in year t+1
$VAIC_{it}$	the independent variable	Value-added intellectual capital for firm i in year t
SD_{it}	the moderator variable	Sustainability disclosure for firm i in year t.
$VAIC.SD_{it}$	the interaction variable	The interaction between value-added intellectual capital and sustainability
Agro_Industry	the control variable	This is a dummy variable (1 = the company is in the Agricultural and food industry, 0 = otherwise)
Tech_Industry	the control variable	This is a dummy variable (1 = the company is in the Technology industry, 0 = otherwise)

Serv_Industry	the control variable	This is a dummy variable (1 = the company is in the service industry, 0 = otherwise)
$Leverage_{it+1}$	the control variable	Leverage for firm i in year t+1
$FirmSize_{it+1}$	the control variable	Firm size for firm i in year t+1

The regression models for this research are as follows.

Direct effects are tested by the following hypotheses.

Hypothesis 1: Intellectual capital (VAIC) has a positive relationship with firm performance.

Hypothesis 1a: Intellectual capital (VAIC) has a positive relationship with ROA

$$ROA_{it+1}=\beta\_0+\beta\_1VAIC_{it}+\beta\_2Agro\_Industry+\beta\_3Tech\_Industry+\beta\_4Serv\_Industry+\beta\_5Leverage_{it+1}+\beta\_6FirmSize_{it+1}$$

Hypothesis 1b: Intellectual capital (VAIC) has a positive relationship with Tobin's Q

$$Tobin's\ Q_{it+1} = \beta\_0+\beta\_1VAIC_{it}+\beta\_2Agro\_Industry+\beta\_3Tech\_Industry+\beta\_4Serv\_Industry+\beta\_5Leverage_{it+1}+\beta\_6FirmSize_{it+1}$$

Testing for a moderation effect

This moderator variable is the third variable (Mod.) that works with the independent variable as an auxiliary independent variable. It can change the way that X has an influence over Y or cause a comparison between X and Y in a group of mediator variables. In the case of categorical variables, it is found when there is a question of why X tends not to have a high influence over Y as predicted. This shows that the relationship line seems to be suitable for certain cohorts of people such as a specific gender, age group, and so on, [58].

This study uses Sustainability Disclosure as a moderator to test the relationship between intellectual capital and firm performance.

Moderation effects are tested by the following two hypotheses.

Hypothesis 2: Sustainability disclosure moderates the relationship between intellectual capital and firm performance.

Hypothesis 2a: Sustainability disclosure moderates the relationship between intellectual capital and ROA.

$$ROA_{it+1}= \beta\_0+\beta\_1VAIC_{it}+\beta\_2SD_{it}+\beta\_3\ VAIC.SD_{it}+\beta\_4Agro\_Industry+\beta\_5Tech\_Industry+\beta\_6Serv\_Industry+\beta\_7Leverage_{it+1}+\beta\_8FirmSize_{it+1}$$

Hypothesis 2b: Sustainability disclosure moderates the relationship between intellectual capital and Tobin's Q.

$$Tobin's\ Q_{it+1} = \beta\_0+\beta\_1VAIC_{it}+\beta\_2SD_{it}+\beta\_3\ VAIC.SD_{it}+\beta\_4Agro\_Industry+\beta\_5Tech\_Industry+\beta\_6Serv\_Industry+\beta\_7Leverage_{it+1}+\beta\_8FirmSize_{it+1}$$

Where:

B_0 = constant

β_1-8 = coefficient of the explanatory variables

4 Research Results

The descriptive statistics of the data from this study are shown in Table 5 and Table 6.

Table 5. Mean, maximum, minimum, and standard deviation of the sample group (N = 370 observations)

Variables	Unit	Mean	Minimum	Maximum	Std. Deviation
VACA	Value	0.2050	- 0.5600	0.9200	0.1379
VAHC	Value	1.8749	- 7.6900	16.3400	1.7708
STVA	Value	0.4541	-12.9700	48.0700	2.7786
VAIC	Value	2.5339	-12.8800	48.0400	3.3086
SD	Ratio	31.2739	16.2000	72.6400	8.9527
ROA	Ratio	3.1865	-67.6200	56.3900	10.2930
Tobin's Q	Ratio	1.6225	0.3800	10.9000	1.2104

Table 5 presents the level of intellectual capital of listed companies on the Stock Exchange of Thailand. The average level of intellectual capital was 2.5339. The highest proportion of intellectual capital was human capital (VAHC) with personnel expenses at an average of 1.8749, followed by structural capital (STVA) at an average of 0.4541, and physical capital (VACA) at an average of 0.2050. It indicates that added value from the use of intellectual capital of companies listed on the Stock Exchange of Thailand mainly comes from the investment in personnel.

Table 6. Mean, maximum, minimum, and standard deviation based on industry group

Variables	Unit	Mean	Mini-mum	Maxi-mum	Std. Devia-tion
Agricultural and food industry					
VACA	Value	0.1976	-0.5600	0.6200	0.1487
VAHC	Value	1.6867	-7.6900	6.6700	1.5074
STVA	Value	0.2178	-4.3800	1.1300	0.6499
VAIC	Value	2.1027	-7.1200	7.6500	1.8734

Variables	Unit	Mean	Mini-mum	Maxi-mum	Std. Devia-tion
SD	Ratio	32.5441	16.2000	54.9400	9.6677
ROA	Ratio	3.6201	-61.4700	20.8300	10.3353
Tobin's Q	Ratio	1.5581	0.4600	7.1000	1.3309
Technology industry					
VACA	Value	0.1613	-0.1600	0.4400	0.1112
VAHC	Value	1.8133	-3.9400	10.7600	2.0336
STVA	Value	0.6589	-0.9200	17.1200	2.0520
VAIC	Value	2.6331	-2.8400	17.0500	2.7624
SD	Ratio	32.5864	19.9100	72.6400	9.3522
ROA	Ratio	3.1354	-46.8400	56.3900	10.9086
Tobin's Q	Ratio	1.4838	0.4800	10.9000	1.3749
Service industry					
VACA	Value	0.2244	-0.0100	0.9200	0.1377
VAHC	Value	1.9893	-0.0200	16.3400	1.7888
STVA	Value	0.4962	-12.9700	48.0700	3.5445
VAIC	Value	2.7095	-12.8800	48.0400	3.9673
SD	Ratio	30.1791	16.9000	56.8100	8.3207
ROA	Ratio	2.9924	-67.6200	55.8900	10.0895
Tobin's Q	Ratio	1.7040	0.3800	4.8900	1.0785

Table 6 Mean, maximum, minimum, and standard deviation based on industry group (Cont.)

In Table 6, when considered by industry group, it was found that the industry group with the highest average intellectual capital value was the service industry with an average intellectual capital value of 2.7095, followed by the technology industry with an average intellectual capital value of 2.6331, and the agricultural and food industry with an average intellectual capital value of 2.1027. In terms of the components of intellectual capital, the highest average of human capital and physical capital was the service industry group at 0.6589. The average sustainability disclosure of the companies listed on the Stock Exchange of Thailand (Table 5) was 31.2739. When it was analyzed by industry (in Table 6), sustainability disclosure had the highest average in the technology industry group at 32.5864.

For multiple regression at the statistical significance level of .05, the results regarding the relationship between intellectual capital (VAIC) and firm performance, including sustainability disclosure are shown in Tables 7 and 8.

Table 7 shows that the value of intellectual capital (VAIC) had a positive relationship with a firm performance at the statistical significance level of .05. Thus, hypothesis H1, including both sub-hypotheses H1a and H1b, was accepted. Intellectual capital had a positive relationship with the performance of the company as measured by return on assets (VAIC at 0.0000, $p < .05$) and Tobin's Q (VAIC at 0.0000, $p < .05$), [10], [15], [16], [21], [33], [36], [51]. This is following the resource-based view theory, which believes that the ability to create value for an enterprise may not be caused by external factors, such as industry, but by internal factors, and can lead to the advantage of owning the capital while improving the firm performance, [4].

Table 8 demonstrates that there was a positive relationship between intellectual capital (VAIC) and firm performance as measured by Tobin's Q (VAIC at 0.0000 and VAIC.SDI at 0.0067, $p < .05$) as the only indicator at the statistical significance level of .05.

Thus, hypothesis H2b was accepted; sustainability disclosure moderates the relationship between intellectual capital and Tobin's Q. In other words, a high level of intellectual capital increases the value of Tobin's Q when a company discloses its sustainability management with an emphasis on the preparation of reports by adding information, such as pictures, and tables, rather than narrative descriptions of issues that could affect stakeholders, such as environmental management and external assurance to guarantee the quality of operations. For example, securities analysts and institutional investors have more information to appraise investments since disclosure allows analysts and investors to assess the opportunities and risks of a company. It can also be used to predict the sustainability of firm performance. Disclosing information allows communities and society to understand and realize the relationship between the survival of the business along with the survival of the community. This can lead to the strengthening of a good relationship with the community and society, [8]. The results of the test are in line with stakeholder theory since firms are expected to disclose information that affects stakeholders. Thus, information on intellectual capital, which is an intangible asset disclosed in the sustainability report, supports investors to make an investment decision based on other reports besides financial reporting, [28]. This can contribute to the success of the business to achieve righteousness or legitimacy with the management of stakeholder groups according to the legitimacy theory, [1], [21], [25], [24].

Table 7. Multiple regression of intellectual capital and firm performance

Variables	ROA_{t+1} (H1a)				Tobin's Q_{t+1} (H1b)			
	Coefficient	p-value	Tolerance	VIF	Coefficient	p-value	Tolerance	VIF
(Constant)	3.6714	.0025*			1.2460	.0000*		
VAIC	1.3292	.0000*	0.8202	1.2193	0.1127	.0000*	0.8176	1.2232
Agro_Industry	1.9160	0.0736	0.8785	1.1383	-0.0831	0.5685	0.8782	1.1387
Tech_Industry	0.9867	0.4089	0.8758	1.1418	-0.2637	0.1058	0.8761	1.1415
$Leverage_{t+1}$	-0.1176	.0000*	0.7465	1.3396	0.0050	0.1214	0.7415	1.3486
$FirmSize_{t+1}$	7.2006	0.2327	0.7349	1.3607	-1.2780	0.1222	0.7318	1.3664
R^2	0.3016				0.088			
Adjusted R^2	0.2919				0.075			
F-stat	31.0961*				6.9312*			
Durbin Watson	1.826				1.1290			

*p<.05

Table 8. Test sustainability disclosure as a moderating variable between intellectual capital and firm performance

Variable	ROA_{t+1} (H2a)				Tobin's Q_{t+1} (H2b)			
	Coefficient	p-value	Tolerance	VIF	Coefficient	p-value	Tolerance	VIF
(Constant)	7.0516	.0000*			1.5462	.0000*		
VAIC	4.4399	.0000*	0.8127	1.2304	0.3742	.0000*	0.8126	1.2306
SD	0.3549	0.5062	0.7058	1.4168	-0.0141	0.8450	0.7062	1.4159
VAIC.SD	0.2516	0.5652	0.9699	1.0310	0.1612	.0067*	0.9698	1.0312
Agro_Industry	1.9161	0.0754	0.8764	1.1411	-0.0624	0.6681	0.8756	1.1421
Tech_Industry	0.7493	0.5336	0.8751	1.1428	-0.2722	0.0933	0.8751	1.1428
$Leverage_{t+1}$	-0.1159	.0000*	0.7363	1.3581	0.0042	0.1883	0.7363	1.3582
$FirmSize_{t+1}$	3.9027	0.5739	0.5587	1.7898	-1.2541	0.1821	0.5588	1.7894
R^2	0.3034				0.1048			
Adjusted R^2	0.2897				0.0873			
F-stat	22.1457*				5.9736*			
Durbin Watson	1.836				1.1417			

*p<.05

However, the statistical test results showed no relationship between sustainability disclosure and firm performance at the statistical significance level of 0.05. This may be because the concept of sustainability disclosure was becoming popular, and such disclosure is voluntary in Thailand. Thus, the management or shareholders might not see the importance of sustainability disclosure on operating results. Furthermore, the amount of time spent on measuring the information may explain the reason for non-difference or the absence of a definite relationship, [24], [42], [43].

According to the statistical test results (Table 8), it was found that the relationship between intellectual capital and firm performance as measured by Tobin's Q was statistically significant in the same direction when sustainability was a moderator. In other words, intellectual capital results in an increase in Tobin's Q ratio as sustainability management in a company increases.

The graphs were plotted to see the trends of Tobin's Q rate and intellectual capital when sustainability disclosure is involved in companies with higher and lower sustainability disclosure than the average (Table 5, number 31.2739). Group 1 presents a lower sustainability disclosure ratio than average, while Group 2 presents a higher sustainability disclosure ratio than average.

Figure 1 and Figure 2 show the overview of all sampled firms in the agricultural and food industry and the service industry. It indicates that companies with good intellectual capital and joint sustainability disclosure, regardless of being higher or lower than the average, improve Tobin's Q of the company since intellectual capital could help disclose intangible assets of the company while increasing clarity, which is consistent with its legitimized

status. This can also enhance the corporate image, and attract investors. Thus, companies tend to disclose their intellectual capital more in their annual report, sustainability report, the official website of the company, or other channels disclosed by the company, [9].

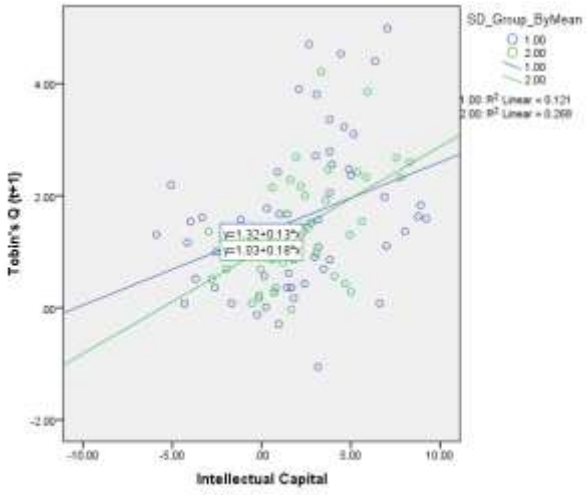

Fig. 1: Relationship between intellectual capital and Tobin's Q of the firm in the agricultural and food industry

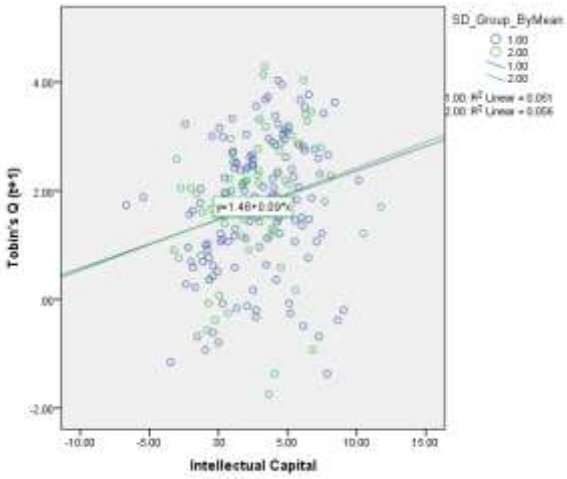

Fig. 2: Relationship between intellectual capital and Tobin's Q of the firm in the service industry

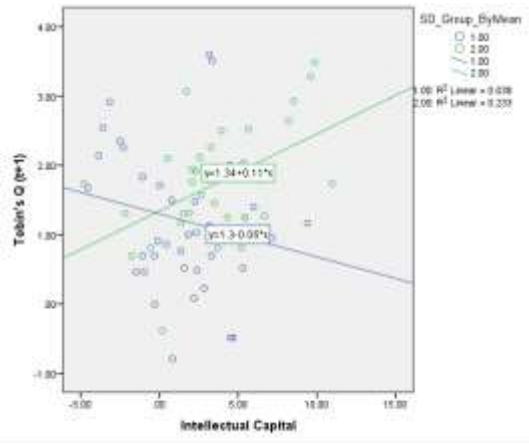

Fig. 3: Relationship between intellectual capital and Tobin's Q of the firm in the technology industry

For the technology industry (Figure 3), the higher the proportion of sustainability disclosure than average in group 2 was found to have a positive effect of intellectual capital on firm performance when a company had a large degree of sustainability disclosure; However, the lower proportion of sustainability disclosure than average in group 1 was found to have a negative effect of intellectual capital on firm performance, when a company had a large degree of sustainability disclosure. When a company discloses insufficient or unclear information regarding sustainability or intellectual capital, it also leads to a decrease in firm performance.

Sustainability management takes time to be effective. In addition, according to the Stock Exchange of Thailand, the technology industry should be based on labor treatment. This is because most of the products in this industry need to be produced in large quantities and this requires employees to serve customers 24 hours a day.

For example, employees in mobile phone network services and internet services have to work harder than other businesses to meet the needs of the customers. It is essential that the business also carefully considers labor issues, [52]. Thus, companies in the technology industry should be more cautious and focus on sustainability and disclosure, which is an important factor in making an investment decision. Companies that disclose information with transparency, accuracy, and completeness can satisfy stakeholders and attract investors, [53].

The GRI standard assisted sustainability disclosure to be more precise and delicate, [45], [46]. Since the GRI standard became the standard in disclosing sustainability, this has helped firms disclose more precise sustainability, [11]. When

comparing the graphs about the level of sustainability disclosure, it can be seen that firms have more activities in disclosing their sustainability. This assists intellectual capital in enhancing firm performance measured by Tobin's Q.

Based on the results of the analysis of the relationship between intellectual capital (VAIC), the performance and sustainability disclosure can be summarized as follows:

H1a: Intellectual capital (VAIC) has a positive relationship with ROA
H1b: Intellectual capital (VAIC) has a positive relationship with Tobin's Q
H2a: Sustainability disclosure does not moderate the relationship between intellectual capital and firm performance.
H2b: Sustainability disclosure moderates the relationship between intellectual capital and Tobin's Q.

5 Conclusion

The objectives of this study are: 1) to examine the relationship between intellectual capital and firm performance and 2) to study the relationship between intellectual capital and firm performance which is moderated by the sustainability of the companies listed on the Stock Exchange of Thailand. The results revealed that most of the intellectual capital value of companies in the three industries came from investment in human capital, structural capital, and physical capital, respectively. In this study, the disclosure criteria of the GRI Standard were used and the data collection model was developed to study the clarity of disclosure of the samples in the study. In addition to the explanatory narrative, it was found that the addition of visual information as tables and pictures, in the disclosed reports along with external assurance could provide more understanding and assure those who use the reports since this type of presentation describes the company better. The highest average sustainability disclosure found in this study was in the technology industry.

Intellectual capital (VAIC) was positively related to firm performance according to the resource-based view theory. The ability to create firm value is not driven by external factors, but by the internal processes of the company. This leads to the characteristics of ownership of that resource, [4]. According to the theory, intellectual capital is an essential resource of a company. It is expected that human capital, structural capital, and physical capital can be used to create firm value. This will ultimately lead to good firm performance, [33] since it plays an important role in increasing the return to the organization while raising awareness of its intellectual capital. This leads to the ability to increase the value of an organization with sustainable advantages, [9]. Although intellectual capital is not recognized as an accounting asset and is seen as a cost with a high amount of money, the results of the study indicate that intellectual capital can reflect firm performance. If companies can manage their intellectual capital properly, it can lead to returns and survival of the business in this highly competitive era, [10], [15]. Companies need operating capital to generate added value or returns arising from intellectual capital since it is an extremely important resource of an organization which can be in the forms of skill development, knowledge, and accumulation of experience embedded in the personnel. Thus, companies must create a mechanism or structure to transfer that knowledge to remain with the organization. However, intellectual capital alone cannot add value to the organization, and efficient use of capital investment is also necessary to lead to sustainable competitiveness, [2], [36], [38].

According to the test, sustainability disclosure moderates the relationship between intellectual capital and firm performance, as measured by Tobin's Q. It shows that by disclosing the information regarding intellectual capital, components of intellectual capital, such as human capital, structural capital, and capital employed related to economic, social and environmental, and knowledge management presented in the sustainability report, annual report, or other channels to communicate with stakeholders are beneficial to market participants since such disclosure reduces the inequality of information between shareholders while increasing the efficiency of the capital market. Likewise, [9] suggested that intellectual capital disclosure is beneficial for stakeholders and knowledge-based economies. Unfortunately, insufficient information in financial reports still occurs since there is no criteria or format, and intellectual capital has not been recognized in financial reports. Thus, it is essential to establish rules or forms that encourage companies to disclose more information about intellectual capital for the benefit of stakeholders to obtain sufficient information, [1]. In addition, the GRI Standard, which has been continuously developed for clearer disclosure of sustainability information, contributes to the disclosure of more

detailed information, [45], [46] and also affects the level of intellectual capital disclosure, [11].

5.1 Contribution

According to the results of this study, intellectual capital enhances firm performance if the company pays attention to the disclosure of sustainability information. Corporate sustainability disclosures are made in response to the needs of stakeholders. This is in line with stakeholder theory, which explains the corporate ability to disclose sustainability on the annual report or sustainability reports. Such disclosure demonstrates that the company has operated with integrity and responds to social expectations for corporate sustainability while enjoying the right to use natural resources and human resources according to the principles of legitimacy theory, together with efficiency in intellectual capital management. As a result, the competitive advantage is extended and the ability to outperform competitors leads to better performance according to the resource-based view theory. The results of this study are useful for management to analyze the data and to invest in intellectual capital through knowledge management, intelligence, and experience of the company to create competitive advantages that differentiate from other competitors in the market, [36]. The disclosure of sustainability management or intellectual capital to support the corporate mission and strategy can also create competitive advantages in the future. Sustainability disclosure in economic, social, and environmental contexts significantly enhances intellectual capital and increases the firm's marketing performance measured by Tobin's Q. However, there is no significance found in the effects on accounting performance measured by Return on Assets (ROA), it should be explained that the firm's profitability and the efficiency of asset management cannot reflect in the short term; it may take a long time to generate sustainable firm performance. Furthermore, the result reflects that firms giving importance to sustainability disclosure tend to have an increasing value in marketing since those firms pay attention to their operation and sustainability for all, including stakeholders. This not only benefits firm performance, but also builds a positive image and reliability as well as attracts investors, traders, and customers to cooperate with the firm. Ultimately, this enhances the firm's market value.

Communication in the form of disclosing corporate sustainability allows stakeholders to understand the management of the company better. Nowadays, besides financial reports, investors use information from other types of reports to ensure that they invest in a company that will not cause problems in the economy, community, society, and the environment. This is also beneficial for the agencies involved in issuing regulations or guidelines for preparing reports. It is vital to establish guidelines and encourage companies to realize the importance of the disclosure of intellectual capital information for the benefit of the organization and its stakeholders. According to stakeholder theory, companies are expected to contribute information related to activities related to their stakeholders. However, investors should also consider other reports besides financial reporting, [28].

5.2 Suggestions for Future Research

In this study, data were limited to listed companies in only three industrial groups: the agricultural and food industry, the technology industry, and the service industry. Future studies should expand their scope to other industrial groups in Thailand to reach a clearer conclusion on whether intellectual capital plays a different role in creating value for the business or not.

In addition, this study measures the firm performance of the fiscal year following intellectual capital and sustainability for only 1 year (year t+1). Future studies should increase the number of fiscal years to confirm whether spending expenses on employee development, sustainability management, and time are the factors that affect the value of an enterprise. In this study, return on assets (ROA) and Tobin's Q were used to measure firm performance. Future studies regarding the relationship between intellectual capital, sustainability, and firm performance may use other variables in measuring firm performance such as Economic Value Added and employee productivity, etc. In addition, future studies can also study similar concepts to confirm the result about the roles of intellectual capital and sustainability disclosure which enhance firm performance but are measured by other methods. It is possible to control variables that may affect the hypothesis such as the length of operation or the cost of research and development.

In this study, certain types of data were limited by access even though measuring the value of intellectual capital by using the VAIC method was well-accepted. Data can be gained from financial statements or notes to financial statements published for all readers, which the researcher can access without difficulty. Nevertheless, it seems to be an indirect investigation because intellectual capital is an issue that requires more in-depth details, and some sources of data are limited. Hence, if future

studies intend to investigate intellectual capital further, it is suggested to use other methods to measure such as

Intellectual Capital Index, Technology Broker, or Skandia Navigator. Then, study specifically the relationship between intellectual capital and firm performance as the result tends to enlarge the benefits to firms significantly.

Sustainability data collection was based on GRI Standards. The study period in the future should be extended to 3 or 5 years to measure firm performance or collect sustainability data by using other methods, such as the KLD index or DJSI instead of GRI Standards.

Further research may employ the mix method for in-depth interviewing with successful firms focusing on intellectual capital and sustainability to gain better firm performance. In addition, the long lag time may be shown in the effects of intellectual capital and sustainability on firm performance over the long term.

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