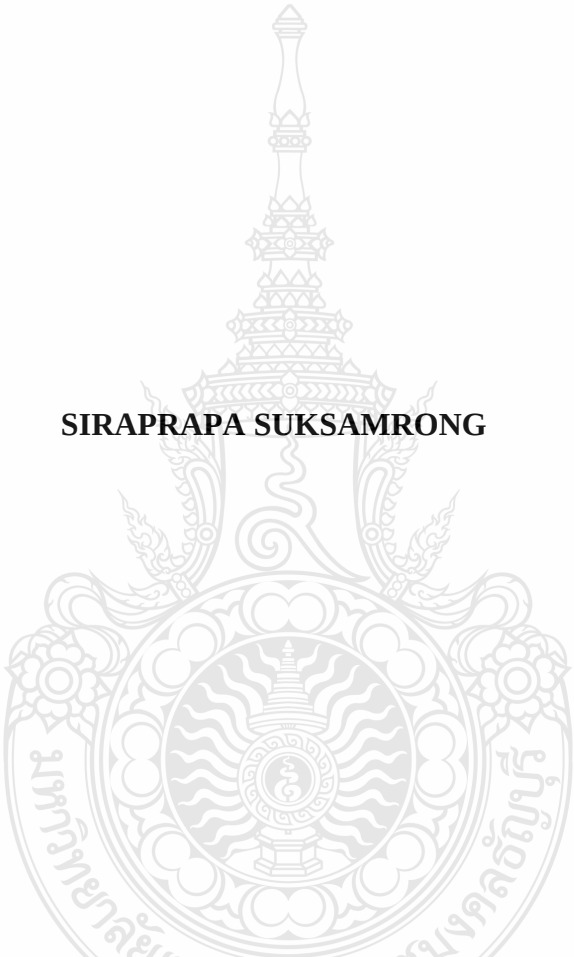
MODERATING ROLE OF SUSTAINABILITY DISCLOSURE ON THE RELATIONSHIP BETWEEN INTELLECTUAL CAPITAL AND FIRM PERFORMANCE

SIRAPRAPA SUKSAMRONG



A DISSERTATION SUBMITTED IN PARTIAL FULFILLMENT
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Dissertation Title	Moderating Role of Sustainability Disclosure on the Relationship between Intellectual Capital and Firm Performance
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Program	Business Administration
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Academic Year	2022

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ABSTRACT

This research aimed to study: 1) the relationship between intellectual capital and firm performance and 2) the relationship between intellectual capital and firm performance moderated by sustainability disclosure. Firm performance was based on the accounting and market performance of the firm with accounting-based performance measured by return on assets (ROA), sales, and return on invested capital (ROIC) and market-based firm performance measured by Tobin's Q. The sustainability disclosure in terms of environment, society, communities, and corporate governance was measured by the Global Reporting Initiative (GRI) standards. Intellectual capital was measured by value added intellectual capital (VAIC). The samples consisted of 185 firms sampled from three industries: agriculture and food, technology, and service, which were listed firms on the Stock Exchange of Thailand. The data were secondary data collected from financial statements published on firms' annual reports (Form 56-1), sustainability reports, and other related information published on websites. Intellectual capital was an independent variable; the moderator was sustainability disclosure, in which the period of collecting data was from 2018 to 2020.

The research results showed a positive relationship between intellectual capital and accounting firm performance of the following year (year t+1), namely ROA and ROIC at a statistically significant level of .05. Meanwhile, intellectual capital had no relationship with sales of the following year (year t+1). Moreover, the study also found that intellectual capital had a positive relationship with market firm performance of the

following year (year t+1) in the same direction at a statistically significant level of .05. This could be explained that having high level of intellectual capital would increase the value of Tobin's Q of the following year (year t+1) in which reflected that when intellectual capital affected accounting firm performance, this also affected the value of market firm performance. When examining the moderating role of sustainability disclosure, the results revealed that the disclosure of sustainability had an influence on the relationship between intellectual capital and the market firm performance measured by Tobin's Q at a statistically significant level of .05. This implies that the relationship between intellectual capital and Tobin's Q tends to be stronger when companies disclose their sustainability practices. This disclosure includes information beyond financial reporting, which helps support investment decisions by investors considering investing in the company, leading to the increase in market returns. However, sustainability disclosure had no effect on the relationship between intellectual capital and accounting firm performance. This could be attributed to the voluntary nature of sustainability reporting during the study period in Thailand. Additionally, the relatively short duration of measuring accounting performance may not fully capture the impact of sustainability disclosure on the relationship between intellectual capital and accounting firm performance.

Further analysis examining industry-specific effects revealed that the technology and service industries showed consistent results with the overall findings. On the other hand, the study did not find any significant influence moderation of sustainability disclosure in the agricultural and food industry. The lack of influence from sustainability disclosure may serve as a recommendation for companies to consider incorporating more importance in disclosing information to address the concerns of stakeholders regarding their internal business practices, particularly in relation to environmental and social issues.

Keywords: intellectual capital, sustainability disclosure, firm performance, GRI Standards

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Siraprapa Suksamrong

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CHAPTER 1
INTRODUCTION

1.1 Background and Statement of Problem

The significant key to drive Thailand's economy regarding the policy of Thailand 4.0 is people. Developing human capital, knowledge, and morality can strengthen the society, in terms of quality, strength, and stability. Moreover, the quality of people can decrease the differences in society. To improve the society, the government should concentrate on the quality of people and sustainability (Office of Innovation Development, Forestry Research Center, Faculty of Forestry, Kasetsart University, 2016). The main goal of Thailand 4.0 is to increase the quality of human capital, especially the group of people who need to fulfill their efficiency but lack opportunities to enhance the social mobility. Giving opportunities and building capability is critical to prevent and protect people from falling into the traps of failure or poverty.

Since there is high competition in the market, businesses need to adjust and keep developing their products and services. However, this depends on both internal and external potentials which can be capital; labor, materials, tools, machines, and means. Although budgeting is the main key for driving business growth, there is another essential kind of capital, called intellectual capital (IC). The development of intellectual capital is the key success to developing Thailand 4.0 as knowledge and innovation are used to drive the Thailand's economy to be sustainable. Previous studies discussed the issues such as intellectual capital (IC), and how it enhanced a firm's performance. Moreover, the higher IC gratitude caused academics to estimate the effect on the company's business performance (Maria, 2014).

IC significantly influences a firm's potential and drives it to better performance, which can be utilized in long term (Klaewtanong, 2020; Phromsuwansiri et al., 2022). IC is still important as it can exert an advantage over other competitors in the market by bringing each individual's intellectual to generate the firm's value. From 1959 to 1997, researchers and economists developed this new idea about business strategies and focused on the efficiency of resources based on utilization, expertise, knowledge management, and learning. According to Edvinsson and Malone (1997), it was the combination of

human capital and structural capital including experiences, technology, customer relationship, and career skills — all of which could generate a competitive advantage. It is necessary to maintain this advantage and avoid being imitated by competitors (Barney Jay, 1991; Porter, 1998). Intellectual capital has now become a part of an organization's success in achieving its goals and increasing volume (Butsalee & Sincharoonsak, 2020).

Previous studies pointed out that intellectual capital has a positive effect on profitability and a firm's market value in the future (Thamprasart, 2014). Investors should be able to receive intellectual capital information for their investment consideration. Firms should have more awareness of measurement and disclosure in intellectual capital for investor requirements, which often change, and for useful stakeholder information.

Due to the significance of intellectual capital, its evaluation has been improved by a variety of measurement concepts. One of the most significant measurement concepts is Value Added Intellectual Coefficient (VAIC) which was developed by Pulic (1988). It is a capable indicator of more organized value added that is enhanced by resources consisting of three components: physical and financial capital, human capital, and structure capital.

Nowadays, the human resource concept has changed in perspective. In the past, hiring employees was the firm's expense. However, human resources are now the firm's asset in which the firm should invest to provide knowledge and skills for the firm's employees to increase the firm's performance and efficiency. If a firm has resources and capabilities which are valuable, rare, difficult to substitute, and difficult to imitate (Barney,1991), then the firm seems to have more sustainable competitive advantages (Ponphai, 2014).

Regarding the details of Thailand's 20-Year-National Strategy (2017-2036), this plan is considered to be part of the goals of sustainable development in transforming the world including 17 goals and 169 aims. It is found that economic crisis still causes poverty for those who are unemployed. Therefore, sustainable growth through employment is important as well as education that supports an increase in quality labor. In environmental sustainability, the main factor is economic development in which all resources need to be reserved for later generations. The main connection between SDGS and Thailand's 20-Year National Strategy is human capital development.

Graham Ward, former Chairman of the Institute of Chartered Accountants in England and Wales (ICAEW) stated that the details about intellectual capital help a firm's investors understand the importance of intellectual capital over the long-term. Human capital has an important role and becomes a tool for business improvement and sustainable competitive advantages. Therefore, measuring and reporting human capital is a significant basis for creating sustainability (ICAEW, 2000).

However, the disclosure of human capital is voluntary. The level of human capital disclosure emphasizes the importance the firm attaches to its employees (Subbarao and Zeghal, 1997). A lot of researchers found that human capital disclosure influenced the estimation by investors to evaluate a firm's value or firm stakeholders. Elias (1972) showed that a firm's human capital information affected the firm's common stock investors. To achieve the global market standard, the quality of human resources is important. The quality of human resources reflects the firm's vision and efficiency through the disclosure of human capital.

Research in the relationship of intellectual capital with firm performance or sustainability has been increasing recently. Pfeffer and Villeneuve (1994) investigated the competitive advantage through people by unleashing the power of the workforce and found that a successful company in a highly competitive market depended on numerous attributes, such as economy of scale, technology, competitive adjustment, and agility along with resources from organizational human capital. Other researchers such as Lawler (1992), Kochan, Osterman and Perline (1995), Levine (1995), and Pfeffer and Villeneuve (1994) also concluded the support for investment in human resource management to gain more efficiency or proficiency; their studies indicated the design for human resource system management to increase the abilities, skills, and loyalty to the organization.

Intellectual capital is found to be the main factor in assisting firms to obtain competitive advantages in the competitive market. Wernerfelt (1984) explained, in terms of the resource-based view theory, that the firm built and controlled its resources, and had the ability to maintain its advantage provided that the firm purchased or obtained its resources from external organizations. If the firm manages intellectual capital properly, this will greatly affect the firm's competitive advantages. Therefore, the higher value of intellectual capital, the greater the firm's competitive advantage. Anisah (2016) and

Libyanita & Wahidawati (2016) showed that intellectual capital has a positive and significant impact on the firm's competitive advantage. This can be successfully achieved by firms that succeed in utilizing their intellectual assets in the following four areas: knowledge, technological skills, experience, and strategic capabilities (Kamukama & Sulait, 2017).

Utama and Mirhard (2016) found that intellectual capital was an important factor determining a firm's performance that in accordance with resource-based view theory could create intangible assets and trigger the greater value of a firm's performance. Moreover, the impact of value-added intellectual capital with complete disclosure of sustainability reporting tends to result in greater than the incomplete disclosure of sustainability reporting. Sustainability reporting also helps a firm provide information on its intellectual capital through its annual report or sustainability reporting prepared separately. Both the annual report and sustainability report jointly create higher value of ROA and ROE. Sustainability reporting contains useful information for the readers, especially for stakeholders. Hence, sustainability reporting should consist of important components of intellectual capital that enhance a firm's performance.

Nevertheless, Thai firms pay more attention to the operation of the environment and society under the concept of corporate governance. In 2016, the Stock Exchange of Thailand reported the context of sustainability estimation in management and improvement and showed an average score of sustainable estimation at 66% which was higher than the year 2015 (average of 63%). However, currently operating firms which have just started sustainable administration may encounter a problem of the starting plan. Corporate sustainability was the result of the operation's responsibility and thoughtfulness for long-term success through awareness in the social community and environment. Creating the firm's sustainability was an important paradigm in modern business administration. The analysis of the firm's sustainability is based on several factors, namely the reliability of the firm, financial security, corporate image, and reputation as perceived by the firm's stakeholders or some business sectors influences the firm's sustainability success (Laonamtha, Paikhamnam & Laohamethanee, 2016). A firm's good reputation supported the perception of its reliability and coordinated its successful performance and confidence. Also, a firm with a high reliability rating from

its stakeholders gained a reputation which led to more sustainable success. Putta, Sudsomboon, and Zumitzavan (2013) found that firms in the financial industry managed their organizational environment systems to enhance accounting performance so that reputation, corporate image, and the firm's sustainability, especially the disclosure of social and environmental reports, were all disclosed to direct and indirect stakeholders.

Aunthong and Akekachaibhibhul (2016) described the concept of a firm's sustainability that can be explained in varied meanings depending on the context of the organization. The main point is to focus on the context of the organization and the importance of economic growth which has the plan and policy of business management under corporate governance and the firm can manage the risk efficiently. Furthermore, the firm still made capital and profit gains to enlarge its operation and delivered a good return to its stakeholders along with being concerned and responsible to society and the environment (Laonamtha et al., 2016). The sustainability report is the measurement of investors to estimate how their firm interests are managed with stakeholders. This annual report deals with the concept, goal, improvement, and firm performance in issues such as social, environmental, and corporate governance for stakeholders.

Most large organizations in the world raise the issue of sustainability as their tool to estimate business in the fluctuating economy and to consider the interests of all stakeholders who benefit from the firm's activities. Sustainability is used to manage the risk of corporate social responsibility and environment. It can be seen that sustainability is not only social responsibility but is also the main strategy of the firm that directs managerial planning in long term. In practice, most organizations tend to aim toward sustainability through the efficiency of resource allocation and management. Nowadays, sustainability is being mentioned wildly and its meaning can be interpreted differently. Therefore, there is an increasing awareness to discuss what corporate sustainability means and the extent that it can be delivered.

In Thailand, firms disclose their sustainability to announce their policies, effects, and the results of their works concerning the environment and society under ESG (Environment, Social, and Governance) issues. This assists investors and users to form wider perspectives beyond their financial perspectives. Such organizations can gain trust both in capabilities in business management and competitiveness as well as long-term

profitability by reporting through their annual reports, sustainability reports, or websites. This benefits investors as a source of data for decision-making apart from financial data. Moreover, this can also benefit the firms themselves because they can utilize the data about ESG to develop their operation, reduce risk, and increase income. The firms can choose the strategy that suits the situation and follow the expectations of stakeholders. All of these lead to proper management and maintain the firm's competitiveness.

Disclosing ESG can reflect the firm's potential and attract the interest of investors, particularly to a firm that has the potential and capabilities of making a long-term profit. Moreover, disclosing ESG also reflects how well the firm can take responsibility of stakeholders, firm performance, and business development both sustainably and continuously.

In Thailand, most firms voluntarily disclose their sustainability. Some countries started with voluntary disclosure but changed to mandatory disclosure such as in China, Denmark, Malaysia, and the United States. Global Reporting Initiative (the GRI set of standards) is used as an indicator to measure GRI, and is uncomplicated and suitable for all sizes of firms or industries to apply. Therefore, it is obvious that firms nowadays seem to have different goals compared to the past. They seem to pay more attention to stakeholders, annual report analysis for decision-making, social work, etc. The GRI is a guideline to collect data about sustainability following form 56-1 issued by the Securities and Exchange Commission (Thailand). To support this, there is a training program and staff to advise about sustainability reporting. Currently, 75 registered firms are reporting their sustainability based on the GRI standards. The GRI standards are often updated consistently with circumstances and the recent set was issued in 2016. The GRI standards do not only function as a report of communication but can be a checklist that assists firms to move forward in the long run (Aunthong & Akekachaibhibhul, 2016).

This study combined two theories, namely the stakeholder theory and resource-based view theory, to prove the importance of a firm's resources which enlarge firm performance, and also, for deciding terms of the long-term policy strategy. This research helps firms to foresee the competencies that they may need to develop for future success as well as to formalize in 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 relations can be sustained in the long run.

This research's purposes were to study the association between intellectual capital, sustainability compliance, and influence on firm performance by investigating the moderating effect between intellectual capital and sustainability disclosure that enhanced firm performance.

The population of this research was the firms listed on the Stock Exchange of Thailand that had long-term investment in Thai industries and global firms. The selected firms had a well-operated finance system, varied in profitability and investments, and operated in the following three industries: technology, agricultural and food, and services, during 2018 to 2020.

(1) The agricultural and food industry in Thailand is one of many industries that has high potential in producing for Thai consumers as well as overseas markets. Since Thailand is a sustainable base of agricultural products, this assists in food processing. The agricultural and food industry is highly related to intellectual capital, particularly in environment, and society. Hence, sustainability disclosure is required to present the risk and efficiency of operation covering all the ESG issues (Sirikanerat, 2022; Sustainable Capital Market Development, 2022).

(2) The technology industry had the highest level of capital employed, which was generated by humans and was used as a facility for production such as factories or buildings. Chen et al. (2005) described that such structural capital supported humans to improve and strengthen intellectual capital. subsequently leading to the development of human capital. In addition, structural capital generated higher volume added among firms in the long term. Moreover, the technology industry was studied because of the fact that intellectual capital is a valuable asset and an efficient tool to compete in this industry in which intangible assets seem to have more importance than tangible assets. Software and information technology firms depend on their employees' skills. Thus, knowledge, abilities, and skills of those employees have an influence on each firm's success. Furthermore, since Thailand is moving forward to Industry 4.0, those mentioned firms in technology industry are the main drivers of the Thailand 4.0 policy. Hence, it is worth studying further (Klaewtanong, 2018).

(3) The services industry has an important role in the world-economy system and in Thailand. Indeed, services has been one of the main industries among developed countries and developing countries. Free world trade introduces new types of services and supports the expansion of trading and investment. Businesses in the services industry significantly provide more jobs and incomes than those operating in other industries. There are a lot of service-oriented businesses, such as healthcare, tourism, education, specialists, telecommunication, accommodation, insurance, airlines, etc. Moreover, after-sale services and installment services are included which can increase the value depending on their services provided to customers (Pedchara, 2019). The most important part of the services industry are the staff or human resources who work for those businesses in contacting and building relationships with customers, and fulfilling the customers' needs. Hence, the staff who are available to serve and provide the best services to customers are obviously vital for the services industry.

Sim-im et al. (2019, p.223) found a positive relationship between intellectual capital and sustainability. The technology industry had the highest average of intellectual capital followed by the services industry and the agricultural and food industry, consecutively. When considering each element of intellectual capital, it is found that the highest average of human capital is the agricultural and food industry. In terms of physical capital and structural capital, the highest average is the technology industry. Moreover, when considering the result of sustainable growth among firms listed on the Stock Exchange, it is found that the agricultural and food industry shows the most significant average followed by the technology industry, and the services industry, consecutively. The sustainable growth rate describes their revenue and dividend payout. Hence, it is predicted that the technology industry and services industry, which both have negative sustainable growth rates, are still encountering the problems of generating revenue or dividends.

Therefore, considering the relationship between intellectual capital, sustainability disclosure, and firm performance, it seems to be difficult to enhance a firm's performance. Even though there is research in the field of administration studying the association, only few researchers have identified moderator variables that enhance the company's performance and relationship with intellectual capital and sustainability disclosure.

1.2 Purpose of this Study

The major purposes of this research were to explore the relationship among intellectual capital efficiency (measured by Value Added Intellectual Coefficient (VAICT™) (Pulic, 1998), sustainability disclosure (measured by the guidance of GRI standards), and firm performance (measured by return on assets, sales, Return On Investment Capital, and Tobin's Q) using evidence from Thai listed firms. The specific purposes of this research are itemized, as follows:

1.2.1 To study the relationship of intellectual capital on firm performance of listed firms on the Stock Exchange of Thailand

1.2.2 To study the moderating effect of sustainability disclosure on the relationship between intellectual capital and firm performance of listed firms on the Stock Exchange of Thailand.

1.3 Research Questions

1.3.1 The research question for testing the direct relationship is how intellectual capital relates to firm performance of firms listed on the Stock Exchange of Thailand.

1.3.2 The research question for testing the moderation effect is to what extent the sustainability disclosure moderates the relationship between intellectual capital and firm performance of firms listed on the Stock Exchange of Thailand.

1.4 Research Hypothesis

To investigate the relationship among intellectual capital, sustainability disclosure, and firm performance, the research hypotheses are presented as follows:

Research Hypothesis 1: Intellectual capital has a positive relationship with firm performance for listed firms on the Stock Exchange of Thailand.

Research Hypothesis 2: Sustainability disclosure moderates the relationship between intellectual capital and firm performance such that the effect of intellectual capital and firm performance is stronger when firms possess high sustainability disclosure than when firms possess low sustainability disclosure for listed firms on the Stock Exchange of Thailand.

1.5 Definition of Terms

1.5.1 Intellectual Capital

Intellectual capital refers to the intangible assets of a firm that can be used to make business more successful, such as its relationships with customers, brands, ideas for new products, and the knowledge and skills of its employees.

1.5.2 Sustainability Disclosure

Sustainability disclosure is the process of disclosing and reporting the data of firm performance in the context of the economy, society, environment, and corporate governance. The disclosed data is systematically taken from the measurement of a firm's efficiency to reflect its potential. Businesses tends to survive in the long term if they utilize sustainability disclosure and improvements to achieve their goals (Tuntimungkorn & Akekachaibhibhul, 2017)

1.5.3 Global Reporting Initiative (GRI)

Global Reporting Initiative (GRI) is a set of standards that guides firms in the sustainability of their operations. GRI supports the application of sustainability reporting as a tool for firms to contribute to their sustainable development through the guidance that reflects the global situation and is published on its website (Global Reporting Initiative, 2006). According to Tuntimungkorn and Akekachaibhibhul (2017), the concept of GRI guided sustainable reporting is popular because it contains an indicator that is suitable and stable for all firms and sizes in every industry.

1.5.6 Firm Performance

Firm performance refers to outcomes gained from a firm's operations which are considered in many dimensions and compared with goals and objectives. This can indicate the firm's success regarding its goals. Firm performance is a way to present how well a firm can utilize its resources from its primary mode of business to increase revenues and gain profit over a set period. It is also similarly used as a measurement of a firm's inclusive financial strengths over time. Therefore, it can be applied to assess firms across similar businesses, industries, or sectors in terms of their relationship. The future firm performance is a proxy for making economic decisions through the firm's internal purpose manager by setting the strategy for firm sustainability while the investors use it to estimate the appraised risk of their investments (Dampitakse & Panmanee, 2015, P.10).

1.5.7 Return on Assets

The return on assets ratio, or ROA, is the profitability measurement that calculates the net income produced by a firm's total assets during a period by calculating net income over the average total assets. In other words, the ROA measures how well a firm can operate its assets to increase profits during a period.

1.5.8 Return on Investment Capital

Return on investment capital (ROIC) is a calculation that is used to measure the firm's efficiency in assigning capital under its control to profitability investment. The return on invested capital ratio indicates how well the firm can utilize its financial resources, including cash reserves, to generate returns. Hence, comparing a firm's return on invested capital with its average cost of capital can explain whether invested capital is being utilized effectively, and this method is called return on capital.

1.5.9 Sales

Sales is the main source of income gained from the actual selling of products or services in a certain period and is a key contributor to a firm's revenue and profit.

1.6 Delimitation and Limitation of the Study

This study was delimited by restrictions. Concerning the nature of this study, several restrictions existed:

1.6.1 The Stock Exchange of Thailand (SET) was the particular focus of the study. The sampling phase of the study collected information from firms listed in the Stock Exchange of Thailand for the 2019-2020 year from firms operating in the agricultural and food industry, the technology industry, and the services industry, while excluding firms under rehabilitation, firms in the trust and fund business, and finance firms (The Stock Exchange of Thailand, 2020). A total of 185 companies were sampled in this way. This study gained secondary data from the financial statements or notes to financial statements, annual reports, sustainability reports, and other information on the website(s) or other communication channels between firms and stakeholders.

1.6.2 This study subjected secondary data taken from sustainability disclosures to the guidelines set by the GRI standards. Also, the measurement of intellectual capital

employed Value Added Intellectual Coefficient (VAIC) which was developed by Pulic (1998).

1.7 Significance of the Study

A study of intellectual capital, sustainability disclosure, and firm performance is important for several reasons.

1.7.1, Significantly, there is the relationship between intellectual capital and firm performance moderated by sustainability disclosure of firms listed on the Stock Exchange of Thailand from three industries: agricultural and food, technology, and services, which can be compared to other countries in the era of the new global economy. The results of this research present empirical evidence of sustainability disclosure to the Stock Exchange of Thailand using the GRI standards guidelines. The study developed multiple regression models to explain more accurately the relationship between intellectual capital and firm performance.

1.7.2 The result of this research can be used as evidence that supports legitimacy theory, stakeholder theory, and resource-based view Theory

1.7.3 Executives realize the importance of IC and utilize the relationship between IC and firm performance as a tool to encourage the measurement and management of IC with the purpose to increase the efficiency of firm performance.

1.7.4 Investors realize the role of IC in forecasting future performance and decision-making based on the information provided.

1.7.5 Control organizations realize information-related decision-making is based on the relationship between IC and firm performance; hence, it is suggested to disclose intellectual capital more voluntarily.

1.8 Conceptual Framework

The researcher built a conceptual framework based on the literature review of the relationship between intellectual capital and firm performance which was moderated by sustainability disclosure. The variables influencing one another, which were chosen from secondary data publicly disclosed on the database of the Stock Exchange of

Thailand, were consistent with those found in related research. Each type of variable is shown in figure 1.1 below.

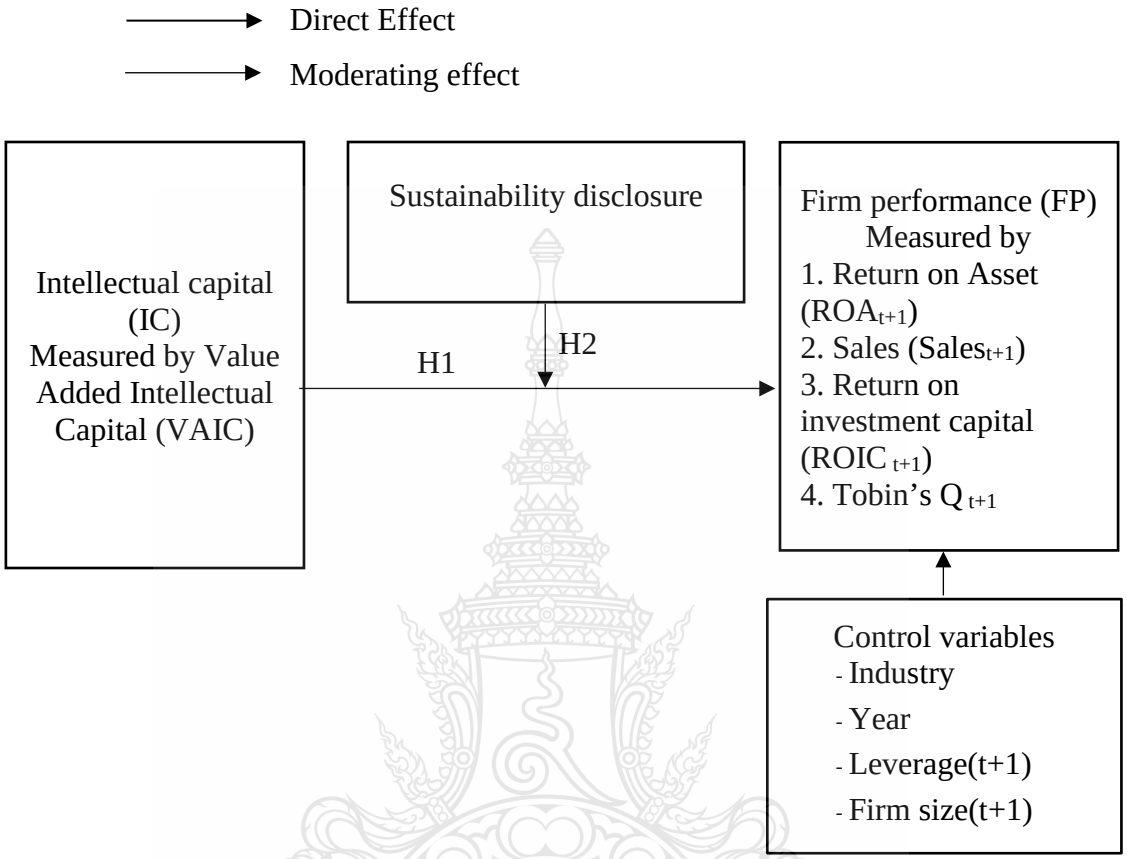


Figure 1.1 Conceptual framework

CHAPTER 2
REVIEW OF THE LITERATURE

To study the exploration of the association among intellectual capital, sustainability performance, and firm performance, this chapter shows the review of prior studies and relevant works of literature. The association of those concepts to formulate the related hypotheses for this study was presented.

2.1 Related Theory

2.1.1 Legitimacy theory

2.1.2 Stakeholder theory

2.1.3 Resource Based View theory

2.2 Concept of sustainability performance

2.3 The voluntary disclosure

2.4 Concept of Intellectual capital

2.5 Concept of firm performance

2.6 The association between intellectual capital and firm performance

2.7 The association between sustainability performance and firm performance

2.8 The effect of intellectual capital on firm performance moderated by sustainability performance

2.1 Related Theory

2.1.1 Legitimacy Theory

Legitimacy theory can be explained as an action to legally generate satisfaction under the law (Suchman, 1995) based on social responsibility. Firms should respond to the community's expectations and also ensure that the action is legal. This can be a social contract between firms and the community indicating natural resources usage. Since firms have to follow social standards, they tend to voluntarily report self-activities when the executives see it is expected by society. Furthermore, there is a high tendency for firms to disclose more about intellectual capital. Since intellectual capital is not indicated as assets; hence, IC disclosure needs to be analyzed. The legitimacy theory, sustainability disclosure, and data analysis are connected.

Additionally, the organization's growth and strength are depended on its operation expected by the community. This concept was created as a guideline for organizations to provide knowledge in terms of social responsibility and sustainable development. The power, authority, and social acceptance gained from the community can indicate whether the organization operated well and followed the community's expectations. However, the right for using natural resources was only temporary. The community will always audit the business operation. The permission included with power and authority can be canceled once the organization offended the contract. Therefore, the organization's survival or development relies on community expectations. The perspectives of social legitimacy concern social responsibilities and natural resources, it is similar to the relationship between organization and community. It can be described that organizations should audit and examine their operation regularly to achieve the community's expectations. According to this study, it can be concluded that community is the main factor controlling business direction. It is said that the legitimacy theory supported social responsibility and environmental disclosure under the purpose of sustainability. The reason that legitimacy has been studied in Thailand because the firms listed in the Stock Exchange of Thailand are required to disclose their good governance (comply or explain approach) in the firm's annual report and annual report (form 56-1) which required by the Securities and Exchange Commission of Thailand to show their activities in social responsibility, environment and so on (Hiransalee, 2014). However, report such as sustainable development report can be disclosed voluntarily.

Therefore, the legitimacy theory is related to the firm's disclosure in which firms tend to disclose more about IC since it is a report of intangible assets. However, there are no specific rules for disclosing intellectual capital which leads to a firm's success (Klaewtanong, 2018; Kurniawan & Muharam, 2021, Bansal et al., 2021; Carvajal and Nadeem, 2022)

2.1.2 Stakeholder Theory

Stakeholder theory is written based on the idea of Barnard (1983) who explained the executives' positive perspectives. Those executives supported social responsibility including employees, customers, sellers, and communities. It is possible to assume that stakeholders are individuals and a group of individuals who may be affected by the firm's

success through its operation. Regarding the stakeholder theory, the report of what is anticipated tends to be reported by stakeholders, in which it assigns social responsibility to economic scale and financial transaction. Firms disclose information about IC, society, and the environment, with more topics than the regulations indicated. Thus, stakeholder theory is generally related to analyzing the data found on the annual reports which are considered the most effective method for firms to communicate to stakeholders concerning intellectual capital to be more specific, all stakeholders are legally entitled to receive the information of individual firms which may affect the stakeholder selves. (Klaewtanong, 2018; Kurniawan & Muharam, 2021; Setiany, 2021; Buallay, 2021; Bansal et al., 2021; Carvajal & Nadeem, 2022)

The study uses stakeholder theory for accomplishing research purposes because social responsibility and a firm's stakeholders are available concepts to apply in business operations. Additionally, a firm with highly ethical management and responsibilities faces sustainability achievement and also constrains more advantages such as good image, high-value branding, and reputation of firms. The quantity of social and environmental responsibility reports may be influenced by factors such as firm size; large firms reported more monetary reports and non-monetary reports and also report their capital structure to their stakeholders than smaller firms (Suttipun, 2012; Hiransalee, 2014).

According to these two theories above can be concluded that firms should show their mission and social responsibilities to their stakeholders through business operation disclosure following the rule (according to Legitimacy theory). Additionally, investors who wish to invest in firms that have a well-operated system of social responsibilities seem to have more confidence for investment not be very costly, also enhances the reliance on local people and it can decrease social force as well. While investors used a public report to estimate their possession; therefore, reports, data, and news were the main factors for estimating their properties and adjusting the property price. They believed in firms with high responsibility and high returns which operated business in their society.

The reason to study the stakeholder theory is to investigate the relationship between IC disclosure and information about sustainability management that may affect firm performance since the disclosure is considered as activities, communication, and

firm’s intangible assets with the purpose to provide the information to stakeholders (Klaewtanong, 2018)

2.1.3 Resource Based View theory

Resource Based View of the Firm Theory (RBV) explained the important role of business operation in the competitive market. If firms can use their resources efficiently and effectively, they will gain more competitive advantages in the market. Strategic human resources management was vital for all companies in terms of competitiveness. There were three main elements as follows;

(1) Value, increasing firms’ value from inside

(2) Rarity resources, unable to search easily

(3) Imitability, unable to imitate

(4) Non – substitutable, cannot be replaced by others. (Barney, 1991, Barney and Wright, 1998, Ditkaew, 2014).

While Barney, Ketchen, and Wright (2011) stated that a view based on theory for gaining competitive advantages, the perspective based on a firm’s resources enhanced the company’s success. The competitive advantages benefited the firm’s performance in long term and also enhanced the company’s sustainability. Resources such as tangible assets, land, building, factory, intangible asset, licenses, good will, reputations, trademarks, brands, patent knowledge, technology skills, innovation, and so on. To increase the firm’s values and resources, the company has to develop the ability to gain competitive advantages. The high-value resources such as intellectual and cleverness, firms should pay more attention to developing both in the short- term and middle- term, even though some resources are rare and seem to take such a long time to develop. To the extent of this, the company should find ways to protect imitating. All resources are very important to gain more sustainable competitiveness that supports the firm’s performance and can be clarified in the chart below;

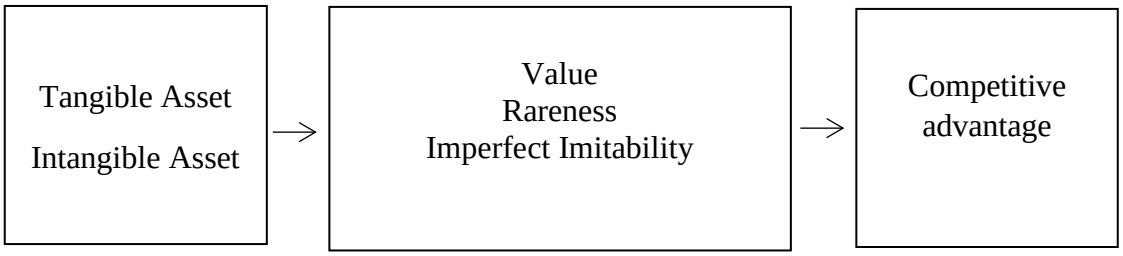


Figure 2.1: Resource based view

Source: Barney et al. (2011, pp.1299-1315)

This theory can be considered a firm's permanent assets; tangibles or intangible assets which can be physical materials, intellectual capital, or knowledge. Firms tend to find new opportunities and resources to encourage an effective administration, utilize the resources usefully, and balance the advantage of having those resources following the firm's goals (Butsalee & Sincharoonsak, 2020)

From above mentioned paragraph, IC is a resource following the Resource Based View Theory, and aspects of IC (Human Capital, Structural Capital, and Capital Employed) are expected to be used to generate higher value and also to increase firm performance (Thamprasart & Phajongwong, 2018; Primasari et al., 2019; Kurniawan & Muharam, 2021; Bananuka et al., 2021; Nakyeyune et al., 2022)

2.2 Concept of Corporate Sustainability Performance

This topic demonstrates the literature review as follows;

2.2.1 Sustainability Disclosure

2.2.2 The Global Reporting Initiative (GRI)

2.2.3 Sustainability Reporting by the GRI Standards

2.2.4 The assurance service provider on a sustainability report.

2.2.5 Sustainability disclosure measurement

2.2.1 Sustainability Disclosure (SD)

Nowadays, the concept of sustainable development is widely accepted, especially by organization executives. Hence, it is expected to lead to firms' success if they focus on social responsibility along with profits reported in numbers, environment, and corporate governance among large firms listed in the Stock Exchange of Thailand.

These large firms or public firms tend to have been engaged with stakeholders or related parties; thus, it is necessary to disclose their information, financial reports, and other related reports. Preparing a corporate social responsibility report or sustainability reporting is the process to disclose general or overall information about the society, the firm's environment, and human resources by having objectives to communicate to the firm's stakeholders and solve society's problems. Additionally, this can satisfy investors as well (Pinta, 2016). With the idea of sustainable development which enhances every part of society to have sustainable development; economy, society, and environment connectedly, now it has become the main way and frame of development from organizations to nations.

The Global Reporting Initiative sustainability guidelines (GRI guidelines) defines the meaning of sustainability reporting as the measurement of sustainability disclosure and responsibility to stakeholders both internal and external organization with the purpose of high efficiency, and sustainable development, following the GRI guidelines which are widely accepted (Global Reporting Initiative 2016) in three dimensions; economy, social, and environment (European Court of Auditors, 2019). The sustainability report is expected to report facts, and positive and negative effects on the economy, society, and environment (Thaipat Institute, n.d.) Firms listed in the Stock Exchange of Thailand are the main mechanism to drive the country's economy. Hence, the Stock Exchange of Thailand supports those listed firms under the concept of sustainability and response to the need of investors' needs. Moreover, sustainability can be a tool to communicate to social- another public relation channel to increase sales volume, reliability, and the image of the organization (Hodkum and Chanruang, 2017, p. 48).

Hence, sustainability disclosure or sustainability report covers propagating and disclosing long-term firm performance in terms of economy, social, environment, and corporate governance as a tool to achieve goals. There are three dimensions as follows;

(1) Environment- firms realize the effects on the environment both in policies, work procedures, planning, and efficient usage of resources. If a certain firm's operation has any effects on the environment, that firm should take high responsibility (for those effects).

(2) Social- firms should concern individuals or other groups of people related to firms or follow human rights such as having proper and moral human resources management, regular staff training programs, encouraging declares to respect and treat their employees properly and supporting communities for sustainable growth.

(3) Governance- firms should have and arrange corporate governance to have transparency, risk management, anti-corruption policy, responsibility to stakeholders, and proper taxation.

Sustainability reporting is different from social responsibility reporting as sustainability reporting focuses on three issues; environment, social, and governance, the data reflects the firm's sustainability. Hence, this report is rather considered as the source of data for investors than the details of being responsible to social that the firm is trying to communicate to the firm's stakeholders. This focuses on the types and characteristics of social responsibilities.

For this developed report, the main objectives of combining all important aspects into the same report are to explain how the firm can increase its revenue. This report will be useful to stakeholders such as employees, customer dealers, communities, and rules issuers. This report also explains concisely the firm's strategies, governance, firm performance, plans, and the relationship between a firm and external environment with capital, fundamental factors for manufacturing, intellectual capital, human capital, social capital, and natural resources capital as to illustrate the relation of strategies, capitals, and firm performance. Overall, this developed report is partly similar to sustainability reporting which is governance in which the report is expected to represent the structure of the current government to support the value added for firms in short, medium, and long-term periods (Kiattikulwattana, 2019).

The importance of the data reported in sustainability reporting cannot be found in any other source. Hence, disclosing the data of ESG becomes useful for certain groups of people as follows;

(1) Firms can plan and anticipate their future and the tendency in which they can follow their framework and also gain sustainability. Moreover, it is possible to reduce risks and problems that might happen to firms since the reporting is following ESG. In

addition, MSCI (2019) confirms that sustainability reporting helps firms see more opportunities and improve their work system to be more efficient.

(2) Assets analysts and investors of all institutes tend to have data for deciding as ESG assists those analysts and investors to evaluate the opportunities and risks that might increase. Moreover, this can also be used to forecast the firm's sustainability as well.

(3) Individual investors report following ESG's guidelines; hence, investors can ensure that they have supported the firms that have no risks affecting the economy, communities, and environment which is in accord with the framework of the Stock Exchange in terms of responsibility investors. ESG report is considered to be another means to communicate to the public explaining one's work plan for an individual investor.

(4) Organization's employees pay their effort into their work if their firm pays attention to employees, respects human rights equality ally is eco-friendly to the environment with its transparency to the public. Besides, employees tend to satisfy their stability if they work for a sustainable firm.

(5) Dealers/customers are satisfied working with sustainable firms which support environmental organizations for the community and social benefits at most.

(6) Creditors are assured to give loans to those firms that operate sustainably as the risk becomes low. Thus, it is likely to be paid when it is due.

(7) Auditors realize the opportunities, risks, and business plans which can be used for auditing; for example, specific topics are needed to investigate or should be addressed. In addition, ESG's data assists in considering the service fees charged for auditing as well.

(8) Communities and society understand the context of the relationship between a firm's survival and the communities' survival which are related to each other in a certain way (Kiattikulwattana and Pattanapanyasat, 2019).

2.2.2 The Global Reporting Initiative (GRI)

The Global Reporting Initiative (GRI) is a voluntary standard framework used for reporting a firm's data in three areas; economic, environmental, and social performance (Global Reporting Initiative, 2002; Goyal et al., 2013). It was released by the Coalition for Environmentally Responsible Economies (CERES) and the United Nation Environment Programme (UNEP) which tends to aid firms and their stakeholders

to know and communicate their outcomes to sustainable development, quality improvement, and usefulness of sustainability reports.

The GRI concentrated on the triple bottom line concept which balanced the complex association among existing economic, environmental, and social needs that are limited to future needs (Global Reporting Initiative, 2002). The GRI suggested a sustainable report context which is presented to be widely used across the world. It was an independent non-profit organization that formed a relationship between multiple stakeholders comprised of researchers, industry, and consultants (Global Reporting Initiative, 2006). The sustainable reporting which used GRI as guidelines were based on principles namely transparency, inclusiveness, suitability, completeness, relevance, comparability, clarity, and timeliness. GRI had its rating scale for amounting to the level of transparency of organizations based on disclosure (Siew-Phaik, Downe & Sambasivan, 2013). The GRI guidelines had the purpose to assist all companies in reporting on the economic, social, and environmental aspects of their performance.

GRI has been increasingly used for sustainability reports as its report index was not complicated to understand and is suitable for all types and sizes of organizations, even in different industries. According to the GRI database on 26 April 2017, it was found that 82% of world great size organizations or 250 firms reported their sustainability in the report included with the GRI concept, also 10,557 firms reported their sustainability in the report with the GRI concept and 27,000 copies had already been published. In Thailand, 177 companies listed and non-listed in the Stock Exchange of Thailand used the GRI concept in their report which about 342 copies had already been published.

GRI released its first concept for the practical report on sustainability in 2000, called G1. After that, it continued to develop its new version of GRI until the latest version came out, called G4, which was used widely since then. The G4 version highlighted in quality of the report rather than quantity, especially the disclosure of analytical issues; important business issues (or materials aspects), and stakeholder analysis. Moreover, changing the reporting level ranking from A, B, and C could make doubtfulness about whether these grades represented the quality of the report or the quantity of the report concerned sustainability. These grades represented the quantity of the disclosure (not the quality) to be in line with the GRI concept. G4 is different from the previous version of

GRI as it is used to measure in terms of quality rather than quantity or can be called “In Accordance” – the core type (disclosure information follows more than 1 indicator by material aspects) or the comprehensive type (disclosure information follow every indicator which was the material aspect), by using instead of grading level method that aims to focus the importance of material report concluded with business context and attracted stakeholders.

According to the popularity of GRI; G4 has been being used continuously. In 2016, GRI released the “GRI standards” compensated G4 which can be used in June 2018, after that, those firms which have ever used G4 have to use GRI standards. 2018, after that, those firms which have ever used G4 have to use GRI standards.

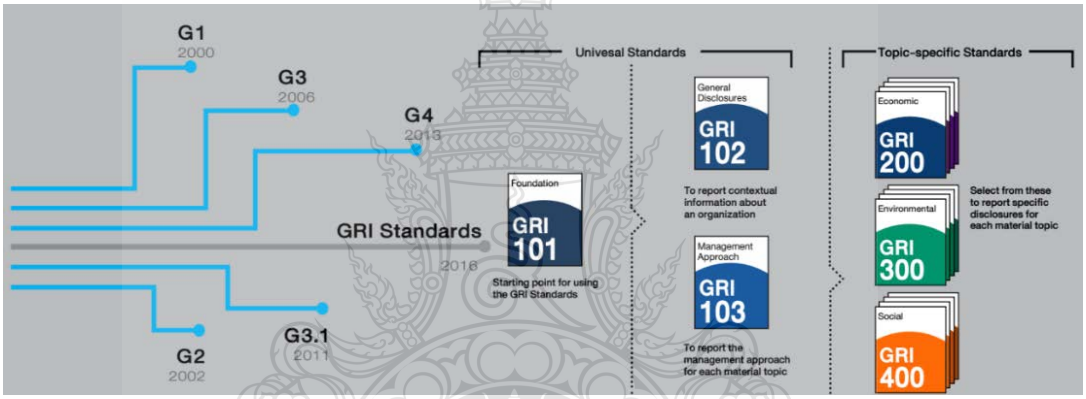


Figure 2.2 The development of GRI

Source: GRI, Tuntimungkorn and Akekachaibhibhul (2017)

Regarding the transforming from the GRI to the G4 version, the GRI standard remains the same in context, principle, and form of a report, including two items namely;

1) Universal standards; company information, corporate governance, firm’s strategy, risk, material aspects, and stakeholder’s analysis

2) Topic-specific Standards

The difference between the previous indicator and the current indicator was the construction of the report that was more systematic and less complicated as some indices were adjusted. Furthermore, the structure of GRI Standards has been created to be able to support the change of indices in the future without the need to revise any indicators. Therefore, if companies have ever reported being in line with the G4 concept, they will

not receive any effects on their operational report. They should always keep following the updated information from GRI.

GRI standards were not developed only for communication but it was also developed to be a checklist to enhance firms to conduct their long-term strategy. As was explained in the article “Sustainability Reporting as a Tool for Better Risk Management” in MIT Sloan Management by Kiron and Kruschwitz (2015), which was presented by the GRI concept, firms may find the gap between business process and stakeholder’s expectations in their value chain. When firms acknowledged the gap and what the obstacles were, they tended to develop the solution to cover the gap and also created the firm’s value-added and decreased future risk. Hence, GRI was not only the report but also business management.

Collecting data process, composing and linking data with the organization’s strategy, measurement and evaluation were the three main processes in reporting. These steps supported firms ‘operations and find their improvement and also arrange the priority of what must be managed first. Furthermore, it supported the administrative section in terms of decision-making leading to constructing innovation to increase more competitive advantages and adding the firm’s value sustainably.

There are many types of sustainable reports. It can be used as it suits the firms. The important issue to be concerned with is the information on sustainable reports; some parts are taken from the annual report, some are separated from the annual report, published through CD, or information on their firm’s website, the firms should find the most available channel to promote. Nowadays, there is a high communication technology aid to help present ESG which can attract more interest by infographic or motion clip via social media channels and also gain the most effective result and good firm’s image.

The Stock Exchange of Thailand Market point to support companies listed conduct sustainability report to be in line with form 56-1 of The Securities and Exchange Commission of Thailand and the concept of sustainability report global; GRI by enhancing more training programs and consulting team in giving advice. Sustainability reporting is the tool or the key to developing a sustainable business. The value of the report is from the process of collecting data, not the paper report (Tuntimungkorn and Akechaipaiboon, 2017).

While, Adams, Muir, and Hoque (2014) found private sector used Global Reporting Initiative (GRI) as a guideline for sustainable reporting than the public sector. It is also found that performance measures greatly utilized by firms were in the aspect of cost efficiency while those utilized least were for learning measures. The GRI was the acceptability type of voluntary strategy for sustainable reporting of firms (Poowadin, 2016).

2.2.3 Sustainability Reporting by the GRI Standards

As of today, there are a lot of standards for sustainability disclosing or reporting. However, it is significant that GRI sustainability reporting standards are widely and well-accepted since a lot of indicators are proper to be used in the report following each business category and stakeholders' interest. Hence, the GRI standards are more convenient and effective for firms to follow. Furthermore, it cannot publish only on an annual report, but also on the firm's websites for both corporate social responsibility reports and sustainability reporting (Kiattikulwattana & Pattanapanyasat, 2019).

A sustainable report was an important method for attracting investors and increasing business confidence. It was also a significant factor that encouraged throughout sustainable investment concept. Global capital market is concerned about a firm's performance in an issue like Environmental, Social, and Governance or ESG by the firm's disclosure for making a sustainable index for instance Dow Jones Sustainability Indices or DJSI (United States of America), SGX Sustainability Index (Singapore) which enhanced the investors had more information not only financial statements and also for concerning in their investment. According to the finding of MIT Sloan Management Review magazine, it is found that 60% of 3,000 investors and investment managers from all around the world read the sustainable report which included details about ESG as it could decrease the risk in long-term investment.

Not only the method such as sustainable report which was the making high opportunity from firm's stakeholders but also the result from The Boston College Center for Corporate Citizenship and EY showed ESG disclosure appealed to the new generation of employees who had great competency to the companies. They inquired about the firm's information about knowledge skills development and the firm's welfare for employees.

It is similar to the chance for a firm's customers and vendors to acknowledge in firm's social and environmental performance.

Nowadays, global institutions develop the concept for improving sustainable reports to enhance stakeholder concerns to be concluded the same standard and have a substantial index such as the Global Reporting Initiative (GRI) and International Integrated Council (IIRC) Comparing the difference between GRI and IIRC, the main target of GRI is that all stakeholders must report its financial performance and non-financial performance (social and environmental performance). However, the main target of IIRC is that investors must calculate their financial performance included with non-financial performance (social and environmental performance). Sustainability reporting following the GRI Standard consists of the following criteria;

(1) Universal Standards (Global Reporting Initiative, 2016)

- GRI 101: Foundation; is the foundation of preparing the sustainability data which consists of two parts.

Table 2.1 Universal standards

Report Content	Report Quality
- Stakeholder Inclusiveness	- Accuracy
- Sustainability Context	- Balance
- Materiality	- Clarity
- Completeness	- Comparability
	- Reliability
	- Timeliness

- GRI 102: General Disclosures; is the disclosing of general information of an organization which consists of organization profile, strategy, ethics and integrity, governance, stakeholders, engagement, and reporting practice.

- GRI 103: Management Approach; is the disclosing of guideline material topics management in three areas both in social and environment topics.

(2) Topic-specific Standards consist of three areas;

Table 2.2 Specific standards

GRI 200: Economic The disclosure of an organization's economic in 6 topics	**GRI 300: Environmental The disclosure of an organization's environment in 8 topics**	**GRI 400: Social The disclosure of an organization's social in 19 topics**
-GRI 201: Economic Performance	-GRI 301: Materials	-GRI401: Employment
-GRI 202: Market Presence	-GRI 302: Energy	-GRI402: Labor/ Management Relations
-GRI 203: Indirect Economic Impacts	-GRI 303: Water and Effluent	-GRI403: Occupational Health and Safety
-GRI 204: Procurement Practices	-GRI 304: Biodiversity	-GRI404: Training and Education
-GRI 205: Anti-corruption	-GRI 305: Emissions	-GRI405: Diversity and Equal Opportunity
-GRI 206: Anti-competitive Behavior	-GRI 306: Effluents and Waste	-GRI406: Non- discrimination
	-GRI 307: Environment and Compliance	-GRI407: Freedom of Association and Collective Bargaining
	-GRI 308: Supplier Environment Assessment	-GRI408: Child Labor
		-GRI409: Forced or Compulsory Labor
		-GRI410: Security Practices
		-GRI411: Rights of Indigenous Peoples
		-GRI412: Human Rights Assessment
		-GRI413: Local Communities
		-GRI414: Supplier Social Assessment
		-GRI415: Public Policy
		-GRI416: Customer Health and Safety
		-GRI417: Marketing and Labeling
		-GRI418: Customer Privacy
		-GRI419: Socioeconomic Compliance

Source: Global Reporting Initiative (2016)

Each organization may consider material topics in economic, social, and environmental areas to be disclosed in its sustainability report by the GRI Standards. It is recommended to choose material topics in order of priority by listing the most important ones to the top which will be indicated as material topics.

2.2.4 The Assurance Service Provider on a Sustainability Report.

Guidance to GRI Standard (Global Reporting Initiative; 2016), There is a variety of approaches to increase the credibility of sustainability reports. One approach used to ensure its sustainability reports is an external assurance which is advised in addition to any internal resources, but it is not required in preparing a report following the GRI Standards.

The GRI Standards show the term “external assurance” referring to the activities and information that an organization designed and published in the conclusions about the quality of the report, systems, or processes such as the process defining its contents or the stakeholders’ engagement process. It is considered to be different from activities organized to assess or approve the quality of an organization’s performance such as issuing the certifications of achieved performance or assessment.

Corporate governance may ask the management team who are responsible for designing and carrying through these internal controls. The confirmation in implementation in the annual report might be only for financial reporting and not extend the reliability of the information in the sustainability report.

An organization can also organize and sustain an internal audit function as part of its reporting processes such as risk management and information reporting management. Furthermore, an organization can also arrange a meeting with a stakeholder panel to review its process of sustainability reporting as well as to provide some necessary advice on the content related to its sustainability report.

Guidance for Disclosure 102-56

An organization may use a variety of methods to search for external assurance such as the use of professional assurance service providers or other external groups. Nevertheless, it is expected that the external assurance service providers are groups of competent providers who follow standards for assurance processing and be able to apply systematic, documented, and evidence-based processes.

In overall, the assurance service providers should have qualifications as the following;

(1) Be independent of any organizations. Hence, they can publish their views and provide an opinion about the report transparently.

(2) Be competent in both subject matters and assurance practices.

(3) Be able to apply quality control procedures to assurance practices.

(4) Be able to conduct systematic, documented, and evidence-based engagement.

(5) Evaluate whether the report was presented properly and reasonably.

(6) Evaluate the GRI Standards and whether have been applied to their conclusions.

(7) Issue a report that includes the opinions or conclusions of the report's preparers and the assurance providers. A summary of the assurance work can also be written in the report.

For the language used in the assurance report, it is recommended to use the broadly-accessible language since some reports use technical language which is not always accessible to all readers.

There is an increasing tendency for assurance processes in sustainability reporting or corporate responsibility reporting by the preparers. In the past, the assurance of sustainability reports only asked stakeholders to prove the transparency and the accuracy of the disclosed data in the report (Laufer, 2003, Moneva et al., 2006). Therefore, certain organizations tend to prepare the assurance on a sustainability report to enhance their credibility through the external assurance service provider. Besides, it also helps develop the quality of sustainability reports (Ball, Owen & Gray, 2000; Rhianon, Jones & Solomon, 2010).

Regarding the assurance of sustainability report surveyed in October 2016 by the researchers from firms listed in the Stock Market of Thailand and the SET 1000, the assurance of sustainability in the years 2013-2015 was 9%, 11%, and 14% respectively. These numbers are relatively relevant to the KPMG survey that there is an increasing tendency of sustainability report or corporate responsibility report each year.

For organizations that conducted the sustainability report, but have not applied the assurance service provider to its report in the years 2013-2015 20%, 23%, and 26% respectively. This increasing number results from an increasing in sustainability reports without preparing an assurance process.

The Assurance of Sustainability Report

In the past, the assurance of sustainability reporting was asked to be implemented by stakeholders to prove the transparency and the accuracy of data published and disclosed in the report (Laufer, 2003, Moneva et al, 2006). Therefore, certain organizations tend to strengthen their credibility by making sure that the data is credible.

Moreover, Global Reporting Initiatives (GRI) which is an independent and non-profit organization that developed the guidelines for making a sustainability report realized the importance of sustainability reporting by improving the report to have credibility as GRI 3.1 and GRI 4 as well as to increase the quality of the report (Global Reporting Initiative, 2011,2015).

KPMG (2011) conducted the survey "Internal Survey of Corporate Responsibility Reporting from 250 organizations in 34 countries and found an increasing number of organizations implemented sustainability reporting in 2008. Those organizations which prepared the assurance of sustainability reporting can disclose transparent and accurate data to managers, customers, investors, and stakeholders. Besides, the survey explains that the assurance can help develop and improve the quality of reporting process to be more efficient (KMPG, 2008, 2011).

The assurance of sustainability reporting also attracts more investors to the market, especially for the organizations that implemented the assurance of sustainability (Cheng et al., 2012). However, assurance is not compulsory for all organizations to follow. Therefore, there are standards used for assurance such as using standards, inspecting, and different assurance reporting (Moneva et al., 2006). Hence, organizations that implemented the assurance of sustainability report are willing to do following the GRI Standards G3, G3.1, and G4.

2.2.5 Sustainability Disclosure Measurement

From the literature review, there are a lot of studies that collected data such as the GRI Standards or any other approach to collect data on whether those organizations disclose or do not disclose to communicate (Ameer & Othman, 2012; Lu, 2013; Jan et al., 2019).

Data Collection

From the literature review, most researchers tend to use an accepted indicator of sustainability disclosure as a standard to investigate the disclosure by giving ‘1’ if disclose, but giving ‘0’ if not. Another approach is to use content analysis by counting the number of words found in the report; however, this cannot present its completeness and quality in terms of how much the firm has disclosed its sustainability.

In this study, two data collection approaches will be compared in terms of how the efficiency of firm performance would change.

(1) Sustainability disclosure; give ‘1’ point if disclose following the GRI standard, but give ‘0’ point if not. The total points are 145 based on the number of 145 indicators.

(2) Sustainability disclosure with explicit result; give an extra point when disclosing with the following details;

(2.1) give a ‘1’ point if disclose following the GRI standard.

(2.2) give another ‘1’ point if disclose by showing pictures or tables.

(2.3) give another ‘1’ point if the report is approved by an external committee.

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.

The Global Reporting Initiative’s GRI Standards Sustainability Reporting Guidelines Performance Indicator is shown in the Appendix of this research.

Then, summarize each firm's results. The results will be computed and adjusted into percentages (%) 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 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;

Table 2.3 The number of indicators for sustainability disclosure for each industry sector

Industry	Sector	The number of indicators for Sustainability Disclosure	The number of indicators for Sustainability Disclosure With explicit result
Agricultural and Food	Food and Beverage	145.00	435.00
Agricultural and Food	Agribusiness	142.00	426.00
Technology	Information and Communications Technology	144.00	432.00
Technology	Electronic Component	145.00	435.00
Service	Transportation and Logistics	142.00	426.00
Service	Media and Publishing	145.00	435.00
Service	Professional Services	141.00	423.00
Service	Tourisms & Leisure	141.00	423.00
Service	Commerce	142.00	426.00
Service	Health Care Services	141.00	423.00

- Agribusiness sector, Transportation and Logistics sector, and Commerce sector. There are 3 indicators to be cut.

GRI 202-1 Ratios of standard entry-level wage by gender compared to local minimum wage

GRI 202-2 Proportion of senior management hired from the local community

GRI 402-1 Minimum notice periods regarding operational changes

- Information and Communications Technology. There is one indicator to be cut.

GRI 410- Security personnel trained in human rights policies or procedures

- Health Care Services sector, Tourisms & Leisure sector, and Professional Services sector. There are 4 indicators to be cut.

GRI 202-1Ratios of standard entry level wage by gender compared to local minimum wage

GRI 202-2 Proportion of senior management hired from the local community

GRI 402-1 Minimum notice periods regarding operational changes

GRI 410-1 Security personnel trained in human rights policies or procedures

2.3 The Voluntary Disclosure

Financial disclosure was created for decreasing the agency problem which aided the shareholders and investors who were a principal and cannot administrate the firms by themselves to acknowledge the financial statement and firm's performance. Not only financial statements; reported the balance sheet, profit and loss, and cash flow constructed by administrators or the agent, but also the Agency Problem originated from the information asymmetry. It can be concluded; the manager had more info operation about financial statements than the investors.

Voluntary disclosure is separated into two categories, the first is traditional information; disclosure about financial performance, financing activities, and investment for instance forecasted income or sale, capital expenditure, and also the detail about the dividend. The main target for disclosure was express information, and communication to the capital market. The last; non-traditional information was the disclosure of issues such as corporate social responsibility; for example, social information, human resource, and environmental policy. This target was different from the traditional information, this communicated data among organizations, governance, or other stakeholders to solve the social problem, which had an indirect effect on the investors' satisfaction (Henderson, Peirson, & Harris, 2004).

Corporate disclosure was an important operation of a sufficient capital market. Firms were created to disclose because of either obligatory disclosure or voluntary disclosure. The voluntary disclosure was done basically as disclosing detail which encouraged the stock market to recognize a hidden cache of firm value and also may gain advantages (Joseph & Taplin, 2011; Roca & Searcy, 2012; Poowadin, 2016). Voluntary

disclosure in accounting was the disclosure of information that exceeded the obligation information limits in conditions of satisfaction or quantity as determined by the management of the firm (Poowadin, 2016).

In recent years, research in the field of corporate voluntary disclosure was increasing. The voluntary disclosure theory illustrated the control variable which based on assumptions, the disclosure was an instrument for passing information occasionally between managers and investors. The research in environmental disclosure was aggregated and used the financial for their control variables, the finding of the research had an effect from the voluntary disclosure theory (Gray, Javad, Power, & Sinclair, 2001). Watson, Shrives, and Marston (2002) stated voluntary disclosure can be concluded as a task for excess showing the accounting and other information associated with the decision expectation of annual reports users, also firms were free selection to provide the details by business operation available. Chau and Gray (2002) showed the ability to image in operation the public satisfaction of corporate environment efficiency. It was claimed that the restatement was linked to communication market contributors stated by González-Benito and González-Benito (2005). Practically, researchers also acknowledged other possibility observers for the data. Lourenco and Branco (2013), highlighted namely express environment disclosure related to investors and other stakeholders, and while Nakao, Amano, Matsumura, Genba, and Nakano (2007) found a sustainability report was the necessary data which hold on qualitative and quantitative firm's information at the level and also firms were able to maintain their economic, environmental and social procedure.

The accounting voluntary disclosure was the detailed disclosure that surpass the compulsory information limit under the conclusion of the firm's management about content or quantity. The research in the field of disclosure has been increasing continuously to study and concern about voluntary disclosure. Several types of research proved the circumstance of firms, which voluntary disclosure for finding the influence and keys of voluntary disclosure (Poowadin, 2016).

The Securities and Exchange Commission, Thailand (2018) illustrates financial statements & reports under Section 56, which have the purpose of providing investors with sufficient information for making their investment decision, the issuing company and listed company (collectively referred to as the company) are required to comply with

the following disclosure requirements: Relevant regulation Notification of the Capital Market Supervisory Board No. TorChor. 44/2556 Re: Rules, Conditions, and Procedures for Disclosure regarding Financial and Non-financial Information of Securities Issuers as follows; persons having duties

The following securities issuers shall have duties to disclose a report on financial and non-financial information to the SEC Office

(1) a listed company;

(2) a company of which shares have been offered or will have been offered for sale to investors under the requirement that the offerors, whether they are the company or its shareholders, shall submit the registration statement to the SEC Office before such offering

(3) a company of which securities [other than share] have been offered for sale to investors under the requirement that the offerors, whether they are the company or its shareholders, shall submit the registration statement to the SEC Office before such offering. In this regard, the securities issuer shall disclose the report until the maturity date of the securities.

The securities issuer's duties to disclose a report on financial and non-financial information to the SEC Office would be ceased when any of the following appears:

(1) the securities issuer has proceeded with the liquidation procedure for dissolving;

(2) the company of which securities have not been sold within the time allowed by the SEC Office or the company has canceled an offer for sale of securities specified in the prospectus unless the company has such duties relating to offering for sale of or issuing other securities;

(3) duties of the voluntarily delisted company would be ceased in particular of the offer for sale of shares and warrants (if any) on the condition that the company complies with any of the following conditions:

(a) after the offer to purchase shares from all of its shareholders has been made under the Regulation of the Stock Exchange of Thailand concerning the Delisting of Securities, the percentage of existing shareholders other than the offeror, persons acting in concert with the offeror and persons under Section 258 [of Securities and Exchange Act B.E.2535 (1992)], altogether, does not exceed 5% of the total number of voting rights of the company;

(b) all shareholders have given written consent indicating their intention to forego their right to receive the information under this Notification; or

(c) the board of directors has passed a resolution approving the general offer to purchase shares and warrants from securities holders and has proceeded with the procedures as prescribed in Clause 42.

(4) the unlisted company or the company's share being non-trading over-the-counter securities center which falls within any of the following characteristics:

(a) being under an absolute receivership order;

(b) being a financial institution, of which business operation has been suspended by an order of a competent officer or authority; or

(c) the company has complied with any of the following criteria. In this regard, such duties of the company would be ceased particularly for the offer for sale of shares and warrants (if any): the number of shareholders and warrant holders, altogether, is less than 100; or the board of directors has passed a resolution approving the general offer to purchase shares and warrants from securities holder and has proceeded the procedures as prescribed in Clause 42.

(d) all shareholders have given written consent indicating their intention to forego their right to receive the information under this Notification.

2.4 Concept of Intellectual Capital

2.4.1 Definition of Intellectual Capital

Intellectual capital was a new concept issue in the 1980s. The not only cost of production or management and so on, but also intellectual capital became a part of costing for describing the firm's value-added completely. Stewart defined the definition of intellectual capital that it was everything, everybody, and so on in the organization, which created a competitive advantage in their market. Edvinsson and Sullivan (1996) stated intellectual capital was the knowledge that was able to turn into a firm's value. It was similar to Stewart (1997), material in terms of intellectual such as knowledge, database, intellectual property, and experience could construct a firm's wealth.

Intellectual capital (IC) was an internal wisdom of an organization and could be called in many aspects such as intangibles, intangibles assets, and intellectual property, in which intellectual capital was accepted as a tool to generate a firm's value and to increase the efficiency of the firm (Butsalee & Sincharoonsak, 2020). Moreover, intellectual capital also helped build an image and supported firms in sustainable competition. In brief, intellectual capital meant a firm's tangible assets gained from employees and resources which could generate higher value. Dividing the elements of intellectual capital depended on perspectives and definitions (Thamprasart & Phajongwong., 2018; Phromsuwansiri et al., 2022). Similarly, intellectual capital meant intangible assets under the firm's context that is gained from humans and resource and constructed the firm's value (Thamprasart, 2014).

Company operation in long term was adjusted by how they invested and improved in the intellectual capital. It was important to manage the company because it showed the real firm value, not only the cost for account recording that was illustrated in the past but also intellectual capital tried to exhibit the value of intangible assets obviously and it included the need for culture for surviving in the current market (Thamprasart, 2014)

Therefore, intellectual capital referred to the total knowledge of the firm's employees which enhanced the competitive advantage and it was the intangible asset such as reputation, customer information, brand name, technology, and corporate culture (Attarit, Dampitakse & Panmanee, 2017).

2.4.2 Components of Intellectual Capital

Human Capital

Stewart (1997) explained that if the firm intended to form its intellectual capital competency, the firm should be capable of the differences between the employees' salary cost and the investment. The value of humans who had the ability in thinking, fabricating, and creating, these based on innovation, creation, and strategy in each company. Also, human capital was the increasing knowledge of employees and made high firm value but did not have them, the firm may face a dropping in own business or industry. It can be assumed that human ability is based on human capital, and it is also the foundation of intellectual capital.

The value of employees can be ideas, invention, and creation which can be the foundation of a firm's innovation, creativity, and strategies. Hence, human capital means the accumulation of employees' knowledge that values a firm. If firms do not have human capital, those firms will face difficulty in surviving. This is considered that ability is the foundation of human capital and human capital is the foundation of intellectual capital. Each individual learns skills, knows how to apply them, and creates innovation as well as increases a firm's value. Hence, it can be concluded that firm performance depends on what employees perceive and be trained. If a firm has outstanding employees with high abilities, this tends to lead to a firm's success. Furthermore, apart from having abilities, motivation, and satisfaction are considered two important things to maintain employees with a firm. If those employees are satisfied with the firm they are currently working for, they tend to stay longer, have the motivation to improve their skills, and generate more benefits for their firms. This tends to increase firm performance; nevertheless, a firm is not the owner of such human capital. When an employee resigns, a firm tends to lose knowledge, skills, or experiences accumulated in that person. Therefore, it is important to build the structure to solve this problem.

In conclusion, human capital (HC) was the main resource of any firm. If a firm had employees who were capable to combine the knowledge, skills, and experiences of each employee in a firm, this would help the firm to create innovation and capability (Butsalee & Sincharoonsak, 2020). Besides, employees who had better abilities or qualifications tended to have better sustainability compared to those who had fewer abilities (Bananuka et al., 2021; Sietas et al., 2022).

Structural Capital

Structural capital was one element of intellectual capital that was built to change human capital to be tangible assets rather than intangible assets such as work processes, technology, or database to support employees to work conveniently and achieve a firm's goals. This stayed permanently with a firm even though employees resigned such as policy and culture. Hence, effective structural capital should be the structure that assisted in sharing or exchanging knowledge since this sustained its business (Yusoff et al., 2019, Bananuka et al., 2021, Sietas et al., 2022).

Pulic (2000) found another element concerning intellectual capital, called capital employed. Since intellectual capital could not operate without having tangible assets, which were the original aspects that assisted firms in creating value. Therefore, when considering all elements of intellectual capital, it was suggested to consider capital employed as well which can be found from the total assets of the firm deducted by intangible assets (Pulic, 1988).

In brief, the elements of intellectual capital; are human capital- employees' knowledge, structural capital- the internal structure that supports employees' work to better quality or efficiency and transfers each employee's knowledge to be kept in a firm's wisdom, and capital employed- tangible assets that generate a firm's value.

2.4.3 Measurement of Intellectual Capital

The intellectual capital was not only the function that carried forward to gain competitive advantages in business but measurement was a problem in terms of practice as it was difficult to estimate, first; account principles were created for the estimation of tangible assets such as buildings, a machine which represented firm's wealth in industry period, although revising and adjustment of account principle always occurred. The second is the intangible asset such as the creation of the main idea knowledge cannot guess in the process. The third, intellectual capital had special characteristics, it can be said such as something is made valuable for some firms but it cannot make for other firms, so the estimation of intellectual capital in each firm was different and also affect to comparison among firms. The last, intellectual capital has consisted of 2 items; the intellectual capital static character could estimate every time, for instance, the ability of the employee, customer satisfaction, and intellectual capital dynamic character, it was not having value by itself but the value happened with some activities such as firms had staff who had skill in programmer made less firm value if it was not fulfilled by good skills in computer programs, loyalty and the relationship between firms and employee also brand influence. The intellectual capital dynamic character value was difficult the estimate and also the higher than intellectual capital static character.

Even though, the difficulty with intellectual capital measurement, the role of importance in intellectual capital was increasing, also creating high business value. Thamprasart (2014) said two reasons for measurement; internal the company's advantages

meanwhile gave the details for considering and made business achieve by associating the relationship between investing in intellectual capital and goal of firms also management ability. External the company's advantages meanwhile enhancing and creating a public reputation, adding market value, decreasing the gap between market value and account value, also taking detail intellectual capital of firms with investors.

Intellectual capital can be measured by many methods. Sveiby (2004) combined methods and divided into four groups regarding the measurement and assessment as follows;

(1) Market Capitalization- is a method to assess the value of intangible assets in cash which measure an organization in overall such as Tobin's Q is a method to measure intellectual capital by calculating the ratio between the asset's market value and its new asset value. Market to Book Ratio identifies how much the investors are satisfied to pay for the stock price of the accounting value (overvalued, equal to value, or undervalued), the market capitalization divided by the book value.

(2) The efficiency of assets management ratio is used to measure intangible assets by measuring the overall organization as similar as the first group.

Economic Value Added (EVA) is a method to measure the value a firm generates (profit) by the costs of intangible assets. EVA shows the efficiency of intellectual capital.

Human Resources Accounting (HRA) calculates the costs invested in human resources of an organization that reduce profit. To measure this, human resources of an organization divided by costs related to human resources such as salary.

Knowledge Capital Earnings is a method to calculate the proportion of normal profit which is overvalued the expected asset value.

Value Added Intellectual Coefficient (VAIC), developed by Pulic in 1998. Instead of direct measuring of intellectual capital, this method measures the efficiency of the added value from using intellectual capital in replacement of VAIC consisting of three capitals; physical capital, human capital, and structural capital. The high value represents the ability to use intellectual in creating value for an organization.

Accounting for the Future (AFTF) is a method to compute cash flow by observing the different outcome between AFTF beginning and AFTF ending. The different outcome found is the added value between beginning and ending.

(3) Scorecard is a method to measure intangible assets in each element separately.

Human Capital Intelligence uses a group of indicators relating human capital to collect data and compare with the current database.

Scandia Navigator- intellectual capital will be measured by 164 indicators consisting of 91 intellectual capital and original indicators covering all dimensions of intellectual capital in five areas; financial, customer, process, renewal and development, and human capital.

Intangible Asset Monitor- executives have to choose a method that is most relevant to an organization's goals and measure the ability to create value of intangible assets in four areas; growth, renewal, utilization, and risk reduction

Intellectual Capital Navigator and Intellectual Capital Index (IC Index)- this method focuses on growth measuring intellectual capital from reviewing all original indicates, then develop new indicators representing the elements of intellectual capital. Subsequently, create a connecting diagram among indicators.

Balanced Scorecard is a method to measure firm performance assisting an organization to use intellectual capital to support its financing successfully by having indicators in four areas; financial perspective, customer perspective, internal process perspective, and learning and growth perspective.

(4) Direct Intellectual Capital is a method to measure financing of intellectual capital separately. When combine all, there will be a total value of intellectual capital as below;

- Technology Broker- measure intellectual capital by using a set of questions investigating an organization's intellectual capital covering four areas; market assets, human-centered capital, intellectual property assets, and infrastructure assets.

There are 20 questions to examine how much importance of intellectual capital an organization focuses. The questions are divided into groups depending on each element of intellectual capital. Finally, to progress and examine the cash value of

intellectual capital by three methods as follows; capital approach by assessing the replacement cost of assets, market ppproach by comparing with market, and income approach by assessing the ability in creating return of assets (Brooking, 1997).

The issue of measurement of intellectual capital and management of intellectual capital was well-known and taken more consideration by researchers and practitioners. While the current situation on economic and net profit was not only the achievement indicator, but the intangible resources of the firm namely; human resources, information technology, and research and development which identified the reputation or image of the firm, also the growth and success as well as to take an opportunity to gain highly competitive advantages and resist long-term financial accomplishment (Attarit, 2016).

According to Pulic (2000) and the process improvement of the Austrian IC Research Centre that tested intellectual capital found the measurement indicator namely "Value Added Intellectual Capital", (VAIC^{TM}). It was an important indicator for utilizing resources and also adding the firm's value.

Pulic (2000) proposed the measurement of firm intellectual capital "Value Added Intellectual Coefficient (VAICTM)" which is associated with tangible assets performance and information. The important elements of VAIC such as human capital, structural capital, and capital employed efficiency were the tool for estimating VAIC. As the result, an increase in VAIC could be assumed that the higher in firm performance. Additionally, the company's market value was formed by the intellectual capital and capital employed.

Value added intellectual capital (VAIC) was the popular research methodology in intellectual capital academic issues. Firer and Williams (2003) demonstrated the advantages of this method namely;

(1) This was the standard method and alternative stable, so it could compare the value with industrial or international.

(2) The detail used to calculate VAIC was taken from the financial statement which has already been approved by the auditor. This could be assumed in the figure with more confidentiality.

(3) This can be understanding and estimating the insider or outsider of the firm, but other methods often have a limit for insider firms. This is also complicated to compute and hard to understand in the organizational context.

VAIC Model pointed to the link associated with economic performance and intellectual capital, which was proposed by Pulic (2000) who was the first scholar in the field of intellectual capital research. The estimation of VAIC is based on the amount on the firm's balance sheet, for instance, financial indicators. The model estimated the obvious economic values, value added (VA), and capital employed (CE), to human capital (HC) and structural capital (SC) and then created a distinctive VAIC directory on this basis.

Intellectual capital has numerous measurement methods. This study has chosen the Value Added Intellectual Coefficient: VAIC which was well-known for large scholarly research at the international level. Due to its advantages as the standard measurement and the ability to compare between industries and international, and also the easy channel to communicate. The estimation conducted by information such as the financial statement that had more creditability was approved by the auditor, publish disclosure, and had no obstacles to access to research information.

VAIC is used to measure how much new value has been increased per invested monetary unit. It is designed to assist stakeholders to monitor and assess the efficiency of value added by a firm's total resources. A high coefficient value shows a higher value creation utilizing a firm's resources including intellectual capital.

This study uses the Value Added Intellectual Coefficient (VAIC) to measure which is widely used among academic research abroad and has the standard in valuing; hence, the results of all sample industries can be compared efficiently. In terms of measuring the value of intellectual capital, the data gained from financial statements are publicly disclosed and assured by auditors. Therefore, this data can be reliable that does not cause any difficulties in assessing the data (Thamprasart & Phajongwong; 2018, Primasari, N. S., 2019; Martín-de et al., 2019; Yustyarani & Yuliana, 2020; Setiany, 2021). The procedures for computing VAIC are as follows:

Step1: Estimation of Gross Value Added

$$VA = Output - Input \quad (1)$$

VA is the value added in the current account period

Output is the total income from selling and service in the current account period

Input is total expenditure except for wages that are paid to employees, tax, dividend, interest, and depreciation in the current account period.

The stakeholder perspectives (Thamprasart, 2014); stakeholders were all individual groups that may gain an effect or may affect a firm's success namely; shareholders, employees, creditors, governance, and social. Therefore, considering in estimation of stakeholders seems to be clearer rather than just testing the firm value added (profit) only which profit was shared with shareholders. According to the above context, the explanation about firm value added follows equation (1) depreciation showed net value added and this concludes with retained earnings in the current period and dividend that returns to shareholders, also other expenditures to shareholders group such as salary, wage, compensation which paid to the employee, the interest paid to creditor dividend to shareholders and tax for government illustrated as the equation as follows;

$$VA = S - B - DP = W + I + T + D + NI \quad (2)$$

S is total income from selling and service in current account period

B is total expenditure except wage that paid to employee, tax, dividend, interest, and

DP is depreciation

NI is the net income

D is dividend

W is wage and salary

I is interest

T is taxation

According to the assumption of clean surplus, the changing of retained earnings or retained earnings which occurs in the current period deduct dividend, it equals net profit after deducting with tax already rewrite the revised equation as follows;

$$VA = W + I + T + D + NI \quad (3)$$

The research by Thamprasart (2014), the measurement of the firm value added by collecting data as net profit plus expenditure which pay to the shareholder group and

the complete collecting data. The principle of collecting expense information is W; expenditure about a firm's employee, but this expense consists of salary, wage, welfare, other employee compensation, and the expense for the development of the employee, for instance, training. The limit to access information occurred because some companies did not disclose their financial statement, the research collects employee expenses from notes to financial statements; expense characteristics. The consideration definition of employee expense was salary, wage, welfare, and other employee compensation even though it does not cover total employee expense which represents human capital, it showed the same topic also often conducted in company collecting, and there was research limitation. While, I represent interest, collect data from the interest and cost of capital, besides, T represents taxation, and the last NI represents net profit after deducting the firm's tax, and these show in the financial report.

Step 2**:** Calculate Value Added Capital Employed coefficient (VACA)

$$VACE = VA / CE \quad (4)$$

VA is value added in current account period

C E is Capital employed which it has ability to estimate by physical asset financial asset or total assets – intangible asset.

VACE is the value added which constructs by 1 item of tangible asset invest in business current account period.

According to the estimation VACA formula or physical capital which measured performance tangible asset to construct firm value added and Pulic (1998) showed intellectual capital not consider physical capital, which calculated by total firm asset deduct intangible asset.

Step 3: Calculate the Value Added Human Capital coefficient (VAHC)

$$VAHC = VA / HC \quad (5)$$

HC is an investment in human capital or salary, wage, welfare, and other compensation in account current. These collect from "employee expense" which shows in notes to the financial statement; expense characteristics. HC is a firm value added which is constructed by one item of human capital in rest in the business current account period.

By using the VAIC method, one important factor that shows the efficiency of utilizing intellectual capital is human capital. Once a firm invests in staff training, the

firm's value is expected to increase. Hence, when the proportion of VAHC is found to be high, this represents the efficiency of human resources management.

Step 4**:** Calculate Value Added Structural Capital coefficient (STVA)

$$STVA = SC/VA \quad (6)$$

SC is structural capital, measures by VA-HC

STVA is the performance of structural capital to take high firm value

Pulic (1998) measured the structural capital by the result after deducting human capital expense from firm value added. Due to not having a direct way to find structural capital. According to this hypothesis, if the firm was high in human capital, it will be affected by to decrease in structural capital, it can be assumed it was reversed relationship. Therefore, Pulic (1998) solved this problem by measuring structural capital not employed as a fraction of proportion to be in line with employee HC as a fraction of HCE proportion, it existed the reverse association. However, the proportion of SCE was the structural capital firm performance to gain high firm value.

Step 5**:** Estimate Value Added Intellectual Coefficient (VAIC™)

$$VAIC™ = VAHC+VACA+STVA \quad (7)$$

In conclusion, VAIC is the efficiency of utilizing a firm's resources to enhance firm value added. It consists of human capital and structural capital which are the main intellectual capital elements. Moreover, Physical capital is an original firm capital that the firm relies on, or it may be the main relying upon some countries. In this study, the Value Added Capital Employed coefficient (VACE), demonstrates how much new value has been generated by one unit of investment in the capital employed. On the contrary, Value Added Human Capital coefficient (VAHC), shows how much value added has been generated by one financial unit invested in the employees. Lastly, Value Added Structural Capital coefficient (STVA) is the indicator of the VA efficiency of structural capital. (Gan & Saleh, 2008, P.122)

2.5 Concept of Firm Performance

Most firms have a system to measure their performance by using financial indicators as a main method which displays in the firm's financial statement. This helps stakeholders acknowledge how efficiently a firm can operate its business. Those financial indicators are an investment, return, net income, growth sales, cash flow, turnover, and net profits. However, some limits obstruct the implementation of financial indicators to measure accurately. If a firm only pays attention to financial statements, it may miss some important data affecting its future profits. In case a firm would develop customer satisfaction, it may increase its budget for research and development. This will help increase customer satisfaction in the long-term period. Analyzing financial statements can be managed based on profitability, firm performance, and risk. Analyzing the past financial statement will help predict future firm performance. The reason to use a financial statement is many numbers in the financial statement cannot explain the details clearly. Comparing the past profit data to the current profit data also helps assess the success and decline of a firm's performance and capabilities. A financial ratio is categorized into four types; liquidity ratio, activity ratio, long-term ratio, solvency ratio, and profitability.

Distinguishing measurements were presented in the literature on firm performance. There was no exact justification to prefer one over the other measurements. To carry out the analysis, the researcher can choose the variables concerning the dependent variables. Financial performance was used to measure firm performance. At first, researchers often employed profitability which was the accounting-based measure such as return on assets (ROA), return on equity (ROE), and return on sales (ROS). In the middle of the 1980s, a market-based measure such as Tobin's Q and market-to-book value (MB ratio) was first used to measure in terms of administration. Since then, two types of measurement have been widely used until the present. Nevertheless, Gentry and W (2010) found the measurement of firm performance both in the accounting and marketing perspectives. Although these two methods have been used and accepted widely, the study found a low positive relationship between these two methods. It can be concluded that measuring firm performance only in certain aspects cannot explain the correct and

complete results of firm performance since the data explains accounting and financial perspectives seem to reflect differently from marketing perspectives.

It can be concluded that VAIC has a positive relationship at the statistical significance of 0.05 with firm performance. Firms registered in the Stock Exchange of Thailand, except banking companies spend on intellectual capital which led to better performance. This follows the resource-based view theory that increasing a firm's value does not depend on external factors but on internal factors. Then, lead to unique resources (Barney, 1991) that cannot be imitated. The components of intellectual capital consist of human capital, structural capital, and capital employed to create a firm's value and also create the higher firm's performance (Thamprasart, 2014, P.86). Refers to the literature review about firm performance measurement, it can be concluded that firm performance can be measured by financial indicators and non-financial indicators. Analyzing data from financial statements should be aware of its accuracy as well. The estimation of profitability which relates to the investment is the measurement of the profitability from the relationship between profit and investment shown in the balance sheet. Additionally, the result presents how a firm's investment increases profit and advantage as follows (Kongsakul & Wisetsub, 2015).

Most researchers use the return on asset (ROA) as an indicator to measure accounting performance since this is widely accepted for measuring the efficiency of firm performance among studies investigating the relationship. (Utama & Mirhard, 2016; Ulum et al., 2017; Thamprasart & Phajongwong, 2018; Jan et al., 2019; Yustyarani & Yuliana, 2020; Bansal et al., 2021; Buallay, 2022; Sietas et al., 2022; Phromsuwansiri et al., 2022; Phromsuwansiri et al., 2022; Carvajal & Nadeem, 2022). Return on investment (ROIC) is another indicator used for measuring a firm's accounting performance to reflect the importance of return on equity and to increase profit.

Since ROIC is not affected by a firm's degrees of financial leverage, it can be a better measurement of profitability relating to return on equity. Firmly high ROIC can be considered a sign of competitive advantage. Increasing earnings and reducing invested capital can increase ROIC. Hence, the firm has a higher ROIC than the average when it has a competitive advantage.

2.5.1 Return on Asset: ROA is the ratio to estimate the profitability from the investment, which came from liability and equity. Moreover, the Return on Asset: ROA is used to compare net profit and total firm assets, it shows the total asset management performance, how it can get the return, and also show how efficiently the investment has managed the benefit.

To operate a business, the main goal is to make a high profit or returned from assets (ROA). Therefore, ROA makes profit measurement. If the ROA of firms is unable to be at the level firm's standard, the cash flow of the firm's investment slightly decreases. The calculation of ROA and net profit is divided by the total asset.

This research uses return on assets (ROA) as an indicator to measure firm performance in terms of accounting for firms in the Stock Exchange of Thailand as widely used by a lot of researchers. In addition, this is an appropriate and available method for collecting data from a firm's financial report, which has been proven by an auditor. The return on assets shows the firm's investment efficiency to gain accounting profit. The formula is net income divided by total assets. Hence, accounting performance describes the firm performance investment as how efficiently a firm can create its accounting net profit. When the ratio displays more than 1, this means a good sign for the ability to operate its returns over the firm's investment

2.5.2 Return on Investment Capital (ROIC)

Regarding the RBV, Lin and Huang (2011) attributed competitive advantage to the varied resources and capabilities of firms in the same industry. Unique resources and capabilities that contributed to the net profits are not included in the balance sheet. To assess these factors, a light asset valuation method is developed to work on these proposals. The significant results confirm all three proposals explaining that asset-light strategies are eligible methods to enhance higher returns with fewer invested tangible assets. Lin and Huang (2011) verified that the asset-light valuation method is proper for measuring a firm's competitive advantage. Lin and Huang (2011) employed return on invested capital (ROIC) as the book rate of return for the measurement of earnings efficiency and expressed the administration's capabilities to increase shareholder value. The existence or nonexistence of the competitive advantage was identified by

profitability. The measurement of ROIC was estimated by using the net operating profit less adjusted taxes (NOPLAT) divided by the invested capital (IC).

When the business is competitive, this means firms in the market try to earn higher profits over their competitors and also to reduce the production cost as low as possible or lower than other competitors. Therefore, competitive advantage can be calculated either from a production or consumption advantage. The production advantage occurs when a firm can supply goods or services at a lower price than other competitors. Meanwhile, the consumption advantage occurs when a firm can supply difficult goods or services which other competitors cannot imitate. The ROIC ratio also helps researchers to study the length or durability of a firm's competitive advantages.

Cusumano, Kahl, and Suarez (2015) confirmed that the combination of the ratios; the relationship with the customer, suppliers, proxy intellectual property, and the management of fixed assets would build a new ratio, call Du Pont Identity or known as ROIC (Return on Invested Capital). Rochmadhona et al. (2018) also used the ROIC for the variables of competitive advantage in a firm. Also, their finding found ROIC has a positive significance on firm performance (measured by ROA) and mediated the association between intellectual capital and ROA.

ROIC is calculated by bringing the cost of investment and the return generated which the returns are the earnings gained after calculating taxes, but before paying interest. The value of an investment can be calculated by eliminating all current long-term liabilities of a firm which due within the year. The cost of investment is considered into two types; the total amount of assets a company requires to run its business or the amount of financing from creditors or shareholders. Hence, when considering the book value and the market value which should be used for the calculation, the book value seems to be more proper because this may result in a misleading number if used for a rapidly growing firm. Besides, the market value often incorporates future expectations and gives the value of existing assets to reflect the business' earning power. When there is no growth of assets, the market value may reflect the situation that the return on capital equals the cost of capital.

Net operating profit after tax (NOPAT) / Book value of Invested Capital

EBIT x (1 – tax rate)/ (Equity + Long term debt)

Although ROIC is accepted to be an appropriate indicator for measuring a firm's performance. Moreover, maintaining an ROIC above WACC seems to be harder than achieving a high ROIC. If a firm is gaining a high ROIC in a certain market, it will automatically draw competitors' attention to the market which happens naturally.

2.5.3 Sales

Higgins (1992) defined "Sales" as the ability to maximize sales volume and reach the highest point and still maintain financial stability. However, it is unnecessary to maximize to the highest point, all firms should maintain their sales volume at the level that its finance stays at the strongest point. Sustainable growth tends to remain constant if there are no changes in four areas; 1) profits 2) rate of dividend payment 3) debts per capita 4) assets.

Donaldson (1984) concluded that businesses are connected without the condition of equity financing (offer shares to the public) following a financial plan; 1) an increase of assets, especially in sales volume compared to original assets 2) the stability of net income from sales volume 3) businesses have arranged proper payment rate for dividend 4) businesses can maintain their financial structure. Donaldson explained the formula for measuring the sustainable growth rate as Change in Assets = Change in Debts/Change in Equity

DuPont (2007) focused on profitability, return on equity, and return on asset. Sustainable growth rate can be measured by maintaining the firm's growth rate consisting of net profit margin, asset turnover, and financial leverage multiplier.

Daily and Dollinger (1992) measured a sustainable growth rate from sales growth, net margin, operating margin, and firm performance by using sales growth or profit growth.

Sales indicate that the efficiency of its sales volume can increase its revenue and profitability. Hence, all firms need to improve and measure the efficiency of their sales to gain profits as high as possible. In addition, all firms can choose the right strategies based on their current situation as well. Hunter and Perreault (2007), and Eggert and Serdaroglu (2011) found that applying technology to strengthen the connection with customers, providing good customer service, improving the quality of services, and planning sales activities will be contributed successfully based on employees' skills.

Additionally, international data infrastructure and external coordinating parts must work together consistently to increase sales volume and also enhance efficiency to a better level. This study will use net sales to reflect net income after deduction (Peter et al., 1998; Pätäri et al., 2014; Bayoud et al., 2012; Poowadin, 2016).

2.5.4 Tobin's Q

Tobin's Q ratio is used as the measurement of marketing performance since the measurement in finance and marketing reflects different aspects (Gentry, 2010). Hence, this study measures the performance in marketing as well to receive the most accurate result. In addition, most researchers tend to use Tobin's Q ratio to measure marketing performance. Primasari, (2019) described that IC measured by VAIC has the highest value which affects the value added of return in marketing measured by Tobin's Q following the resource-based view theory. Competitive advantage comes from the total resources which IC is included consisting of human capital, physical capital, and structural capital. All of these three aspects are required firms to pay attention and also to give importance to IC (Thamprasart & Phajongwong, 2018, Hodkum & Chanruang; 2017; Bansal et al., 2021; Buallay, 2022; Carvajal & Nadeem, 2022).

This ratio was developed by Professor James T. Tobin who divided the value of assets by the assets' price since it reflects the actual value of these assets that can be invested in any other source of investment. If firms cannot gain higher market value than replacement cost. Therefore, it can be said that if a firm has Tobin's Q below 1, it means it is unable to efficiently utilize its assets. However, the calculation needs much time and costs to collect. Chung and Pruitt (1994) improved the calculation method by calculating the market price from the total value of common stocks (the market price of common stocks to be multiplied by the number of common stocks), the market price of preferred stocks (the redemption of preferred stocks) and the market value of liabilities (net liabilities value on current assets and the book value of long-term liabilities) and use the value of assets in replace of the replacement cost of assets. The value shows that the result is likely the same as Tobin's Q by Professor James T. Tobin. Then, Domodaran (1999) improved the calculation in which this study is currently using this formula.

$\text{Tobin}'\text{s } Q_{t+1}$ = (Market Capitalization + Total Debt)/ Total Assets

Market capitalization is the market price of registered assets calculating the close price of registered assets multiplied by the total units of registered assets. This indicator is used to explain the size of registered assets and the size of the stock market (Setinvestnow, 2020)

From the above explanation, this study aims to measure firm performance by investigating Return On Assets (ROA), Sales, Return On Investment Capital (ROIC), and Tobin's Q which is measured based on the year after the forecasted year. Therefore, the data for the years 2019-2020 will be conducted for further analysis.

2.6 The Association Between Intellectual Capital and Firm Performance

According to the importance of intellectual capital which raised more interest in academic research, measurement, and taking benefits to gain competitiveness and also increased firm value, researchers tried to find empirical evidence that demonstrated the association between intellectual capital and firm performance by using different indicators for measurement. From the literature review, the researcher found various conclusions. Accumulating intellectual capital included people and value-added products to the firms. Having efficient employees is the main factor to gain more income. It can be stated that human capital is one element of intellectual capital that has special attributes such as complementary or a carried-out key.

Intellectual capital (IC) is increasingly accepted as a main driver of competitive advantage and sustainability. Manufacturing companies should maintain awareness of IC and invest more intellectual capital to sustain their competitive advantage. Recognizing the importance of all IC components, companies also should develop strategies to invest in different components of IC by appropriately allocating their limited knowledge-based resources. By examining previous research on intellectual capital and competitive advantage, the researchers found a positive relationship between intellectual capital and competitive advantage as described below. Intellectual capital has its importance and is considered to be the essential resource to generate profit which affects firm performance in terms of accounting following the Resource-based View Theory by Barney. Premium intellectual capital assists a firm's administration.

Numerous research found positive effects between intellectual capital and firm financial performance which used different measurements. Ulum et al. (2017) described that intellectual capital enhances a firm's profitability measured by ROA, reflecting that premium IC owned by any firm is considered an important resource that assists a firm's administration to gain better outcomes. Thamprasart and Phajongwong (2018) found that IC measured by Value Added Intellectual Coefficient (VAIC) had a positive relationship with accounting firm performance measured by ROA and ROE. When considering the relationship of intellectual capital measured by VAIC of the previous year compared with the current year's firm performance measured by employee productivity, it was found that the past year's intellectual capital enhanced the value added among firms and affected future firm performance.

Jaroentthip (2018) and Primasari (2019) described that intellectual measured by VAIC had higher value which affected the value added to marketing returns measured by Tobin's Q. This is following the Resource-based View Theory. Competitive advantage gains from the total resources including IC; human capital, physical capital, and structural capital. All these capitals are essential and a priority for firms to realize their importance in terms of IC management (Yustyarani and Yuliana., 2020). Human capital is the main key to assisting any firm to achieve goals, to create added value to competitive advantage to not be imitated (Kurniawan & Muharam, 2021; Costa et al., 2022; Sietas et al., 2022; Sucena et al. 2022). Moreover, it could be rare items that could not be imitated and made competitive advantages (Thamprasart, 2014). An increasing amount of intellectual capital can construct high firm value (Berzkalne & Zelgalve, 2014).

Intellectual capital was considered a crucial firm's resource to develop profitability, while the most considerable element of intellectual capital which positively related to driving value were human capital and capital employed. Furthermore, finance and physical capital also showed a significant role in creating a firm's profitability and market performance. Additionally, positive effects such as the association between human capital and return on equity, structural capital and return on equity, and IC had an impact on financial performance. This is a very important and significant conclusion as it shows that intellectual capital has an important role in a firm's performance significantly. Stakeholders must account for the

contribution of intangibles as well while considering the value and firm's performance. Intellectual capital affects traditional financial firm performance. By looking through the perspective of RBT, superior intellectual capital owned by a firm was the firm's resource which can be accounted as capital for its management. There is a positive and significant relationship between intellectual and market share. When the level of a firm's intellectual capital increases, its market share will increase. This occurs because each component of IC (human capital, structural capital, and relational capital) has a significant role in increasing the market share and indicating the confirmation of human resource theory. As discussed, IC effects financial performance, the result was tested. There is a positive relationship between IC and financial performance. Therefore, an increasing level of IC of firms will enhance greater financial performance (Nimtrakoon, 2015; Kamath, 2015; Ulum 2017; Fahimi & Fakhari, 2017; Rashid et al., 2018).

Intellectual capital would become a competitive advantage when a company was able to manage well, hence added value would be provided for the stakeholders. Intellectual capital was a key resource that drove the firm's performance and value creation. Thus, intellectual capital played an important role in creating and maintaining a firm's competitive advantage (Rochmadhona, et al., 2018). Also, the suggestion from Oppong and Pattanayak (2019) research invested more in intellectual assets as they were important tools to drive their productivity, the significance of financial capital in boosting bank productivity. The results proved the proposal of the firm's RB theory that physical or financial resources may provide higher expected returns. The companies should integrate intellectual capital into their value creation processes and communicate it to relevant stakeholders. Managers should prioritize disclosing information related to IC, which can help strengthen employee loyalty and collaboration between different departments (Hejazi et al., 2016; Baima et al., 2020; Alnsour et al., 2021).

On the contrary, the negative association among intellectual capital and firm financial performance, the elements of IC as value added human capital efficient was negatively related to ROE and MB; firms which increased on VAHU were significantly devalued in the market. Humans was a major role in efficient variation (Morariu, 2014). It was consistent with Thamprasart (2014) that the negative effect of Value Added Human Capital Coefficient (VAHC) on firm performance, is the human capital could not make a

return on firms within the same accounting period, the investment in humans created high expenses and then made firm performance decrease. It was similar to Nimtrakoon (2015) who stated the negative association between VAIC and return on equity, it implied that stakeholders were not aware that IC was a source of value creation. While STVA and return on equity showed a negative relationship as firms still needed to preserve and attain structural capital both internal such as brands, patents, copy right, monitoring systems, and information technology systems, and external relationships with customers and suppliers could expect accompanying investment and expense for the firms. Jaroentthip, (2018) Value Added Intellectual Coefficient (VAIC) in previous years has a significantly negative relationship with ROA and RG. Moreover, Thamprasart and Phajongwong (2018) found that human capital has a negative relationship with both accounting firm performance and marketing firm performance since human capital measured by related expenses with the firm's employees could not generate any profit within one year.

However, Kamath (2015) found no empirical evidence of intellectual components influencing the productivity of firms. Moreover, it is said that firms tended to look more at their tangible assets for creating value. It was to be concluded with Setiany (2021) explained that there was no relationship among the elements of intellectual capital; human capital, structural capital, and capital employed, with the value measured by Tobin's Q. This, reflected that these firms could not administrate these three capitals and increase proper management in terms of creating value to firm performance. This is consistent with Phromsuwansiri et al. (2022) who found that the efficiency of intellectual capital measured by VAIC had no relationship with firm performance (measured by ROA, ROE, NPM) in which this might have been affected by timeline and collecting period including other factors that may have affected the data such as expenses spent for employees who may have had any difficulties from an economic crisis and the COVID-19 pandemic.

From the review, it was found that a positive influence between intellectual capital and the efficiency of firm performance enhances firm performance and the ability to increase a firm's value which is derived from internal factors, not external ones. This is consistent with the Resource-based View Theory with the concept to maintain a firm's rare, inimitable,

valuable resources to increase its advantage. Hence, this leads to hypothesis 1 as follows; These previous findings permitted the formulation of the following hypothesis:

Hypothesis 1: Intellectual capital has the positive relationship with firm performance of listed firms on the Stock Exchange of Thailand.

Table 2.4 The summary of relationship between intellectual capital and firm performance

No.	Author	Title	Independent Variable	Dependent Variable	Result	Findings
1.	Thamprasart (2014)	The Relationship between Intellectual Capital and Firm Performance of Listed Companies on The Stock Exchange of Thailand	VAIC	-Accounting-based Measure 1) ROA 2) ROE -Market-based Measure 1) Tobin's Q	Sig. (+)	VAIC shows significantly relationship with accounting firm performance. This means that VAIC is worth investing as it can increase return to firms. However, there is no significant relationship with marketing firm performance. This means that investors have not noticed the value added from investing in VAIC. When consider each aspect of VAIC, it is obviously that each aspect has relationship with firm performance in the different ways , which is VAHC. This shows negative relationship as expenses spent for employees do not increase return in the same year of investment. Meanwhile, STVA and VACA show significantly positive relationship with firm performance. Hence, those listed firms on the Stock Exchange of Thailand should utilize these factors to boost firm performance.

Table 2.4 The summary of relationship between intellectual capital and firm performance (Cont.)

No.	Author	Title	Independent Variable	Dependent Variable	Result	Findings
2.	Nimtrakoon (2015)	The relationship between intellectual capital, firms' market value and financial performance: empirical evidence from asiam countries	MVAIC	- Market value - Financial performance 1. margin ratio 2. return on assets (ROA)	Sig. (+)	The research reveals a significant effect of IC on both firms'market value and selected financial performance measures. Specifically, a positive relationship between IC and firms' market value, and that between IC and two traditional financial performance measures, margin, and ROA, have been identified.
3.	Ulum et al. (2017)	Modified value-added intellectual coefficient (MVAIC) and traditional financial performance of Indonesian biggest companies	MVAIC	ROA ROE M/B PER	Sig. (+)	This proved that intellectual capital affected the performance of the traditional financial performance. When viewed from the perspective of RBT, superior intellectual capital owned by a company was the organization's resources as capital for managing organizations better. The excellence of the intellectual capital of the company is believed to affect the financial performance.

Table 2.4 The summary of relationship between intellectual capital and firm performance (Cont.)

No.	Author	Title	Independent Variable	Dependent Variable	Result	Findings
4.	Kamath (2015)	Impact of Intellectual capital on Financial Performance and Market Valuation of Firms in India	Value added intellectual coefficient	Market value (MB): Market capitalization of the firm's shares	Sig. (+)	It is observed that though intangibles have an overall impact on the market valuation of firms, its only capital expended that finally has
				Return on Assets (ROA)	Sig. (+)	the highest impact. This is a very important and significant conclusion as it shows that intellectual capital has a role in the performance of the firms. The stakeholders now have to account for the contribution of intangible, also while looking at the value and performance of the firm.
				Growth of sales (GS)	Sig. (-)	The overall model is a bad fit, even the components of IC were seen to be statistically insignificant impact.

Table 2.4 The summary of relationship between intellectual capital and firm performance (Cont.)

No.	Author	Title	Independent Variable	Dependent Variable	Result	Findings
5.	Fahimi and Fakhari (2017)	THE MEDIATING EFFECT OF FINANCIAL PERFORMANCE ON THE RELATIONSHIP BETWEEN INTELLECTUAL CAPITAL & MARKET SHARE: EVIDENCE FROM TEHRAN STOCK EXCHANGE	Value Added Intellectual Capital	Market Share	Sig. (+)	There is a positive and significant relationship between intellectual capital and market share. This means that with the increase in the level of intellectual capital in organizations and companies, their market share will increase because the components of intellectual capital, which are human capital, structural capital and relational capital, each has a significant role in increasing the market share, also indicating of confirmation of human resource theory
				Financial performance that in this study we used the return on equity (ROE)	Sig. (+)	The effect of intellectual capital on financial performance was tested. The result of this test shows that there is a positive and significant relationship between intellectual capital and financial performance. That is, increasing the level of intellectual capital in organizations and companies will improve their financial performance.

Table 2.4 The summary of relationship between intellectual capital and firm performance (Cont.)

No.	Author	Title	Independent Variable	Dependent Variable	Result	Findings
6.	Rashid et al. (2018)	Impact of Intellectual Capital on Firms' Market Value and Financial Performance: Empirical Evidence from Pakistan	VAIC	- Financial performance 1. ROE 2. ROA - The ratio of market value of firm to book value firm	 Sig. (+) Sig. (+) Not found any relationship.	These results indicate that investor gives no importance to SC efficiency and human capital efficiency and these elements of IC influencing the market value of firm in case of this study. The results of this study found an insignificant impact of IC and market value, the probably because of the reason that Pakistani markets are not perfect markets. Likewise, direct relationship has been found between Social Capital and ROA and ROE confirming the hypothesis that structures and good working environment facilitates employees to perform operations in a better way.

Table 2.4 The summary of relationship between intellectual capital and firm performance (Cont.)

No.	Author	Title	Independent Variable	Dependent Variable	Result	Findings
7.	Onumah and Duho. (2018)	Intellectual Capital: Its Impact on Financial Performance and Financial Stability of Ghaninan Banks	VAIC™	-Financial performance; ROA -Financial stability; Z-Score	Sig. (+) Sig. (+)	The empirical result of the impact of IC on financial performance reveals that IC drives financial performance. This supports the resource-based view which argues that IC is essential in increasing sustainable competitive advantage which eventually results in increased financial performance. HCE was evidenced to be the most contributing factor in driving financial performance. Thus, banks that are unable to harness the potentials of their employees in creating value will perform abysmally in terms of financial performance. CEE has a positive effect on financial performance. Although this relationship was insignificant, the positive relationship suggests banks that are able to create more value from shareholder's capital have increased financial performance.

Table 2.4 The summary of relationship between intellectual capital and firm performance (Cont.)

No.	Author	Title	Independent Variable	Dependent Variable	Result	Findings
8.	Rochmad hona, et al. (2018)	The Competitive Advantage between Intellectual Capital and Financial Performance of Banking Sector in ASEAN	Intellectual capital (measured by Extend VAIC Plus)	Return on Asset (ROA)	Sig. (+)	The research shows the significant positive effect among intellectual capital and financial performance. Resources that serve as a competitive advantage can be classified into resource heterogeneity and immobility that can be used as capital to compete with its competitors. Therefore, when a company earns a high profit resulting from intellectual capital and competitive advantage, it can be said that the company succeeds in creating superior sustainable performance.

Table 2.4 The summary of relationship between intellectual capital and firm performance (Cont.)

No.	Author	Title	Independent Variable	Dependent Variable	Result	Findings
9.	Oppong and Pattanaya k (2019)	Does investing in intellectual capital improve productivity? Panel evidence from commercial banks in India	Value Added Intellectual Capital	Employee Productivity (EP)	Sig. (+)	The individual influence of all the IC components on EP. The study found that among the three IC components, only CEE had a meaningful influence on EP at banks. This result shows the significance of financial capital in improving bank productivity.
				Asset turnover (ATO)	Sig. (+)	The study finds a convincing positive association between the three IC components and asset turnover at the full sample of banks. The results reflect the principles of RB theory which are useful and gain competitive advantage, unique resources (whether physical, human, or organizational) help to build competitive advantage and generate economic returns for a firm.

Table 2.4 The summary of relationship between intellectual capital and firm performance (Cont.)

No.	Author	Title	Independent Variable	Dependent variable	Result	Findings
10.	Jaroenthip (2018)	Intellectual Capital and Firm Performance in Thailand	Intellectual Capital	Firm Performance year t, year t+1		
				1) ROA	Sig. (+) with year t, Sig. (-) year t+1	When VAIC is high, firms gain higher profit per net assets and per employees. However, when VAIC is low, a firm gains low profit per net assets and per employees.
				3) Employee productivity	Sig. (+) with year t and year t+1	VAIC is considered as a firm's essential resources following the Resource-based View Theory. The result of the relationship tested between previous year's VAIC and current year's VAIC shows that the previous year's VAIC has a significantly positive relationship with the efficiency of employees which is also the same with the current year's. Hence, investing in VAIC generates the value added on firm performance continuously in which affects future firm performance.
				2) ROE	Not sig. (-) with year t and year t+1	Since, there is no significant relationship with ROE. This may have been affected by other factors such as owner's equity or interest expenses.

Table 2.4 The summary of relationship between intellectual capital and firm performance (Cont.)

No.	Author	Title	Independent Variable	Dependent variable	Result	Findings
11.	Primasari (2019)	INTELLECTUAL CAPITALAND SUSTAINABILITY REPORT DISCLOSURE TOWARD COMPANY VALUES ANALYSIS Case study of company listed in LQ-45 stock group for the period 2015 – 2017	Intellectual capital measured by VAIC	Tobin's Q	Sig. (+)	Intellectual capital significantly influences firm's value generating. The results of this study describe that effective, maximum administration and the usage of intellectual capital have been proven to increase the value of the company measured by Tobin's Q in this research.
			Sustainability report disclosure measured by SRD		Sig. (+)	The sustainability report disclosure has a positive effect on a firm's value. These results illustrate that sustainability report disclosures are able to enhance a firm's value measured by Tobin's Q. The disclosure of the economic dimension in the sustainability report will boost corporate transparency which has an influence on investors' confidence.
12.	Kurniawan and Muharam (2021)	The effect of Intellectual Capital on profitability with Firm size as moderating variable (Empirical research on state-owned enterprise in Indonesia 2012-2020)	Intellectual Capital (VAIC)	Profitability; ROA	Sig. (+)	Hence, it can be concluded that VAIC has a positive effect on Return on Assets (ROA). Even though intellectual capital, an intangible asset, is difficult to be measured, it shows that investing in intellectual capital is a positive proposition since an increase in VAIC, as a proxy for intellectual capital, is able to increase the firm's profitability. Hence, it is important that firms need to pay attention on increasing its intellectual capital.

Table 2.4 The summary of relationship between intellectual capital and firm performance (Cont.)

No.	Author	Title	Independent Variable	Dependent variable	Result	Findings
13.	Yustyarani and Yuliana (2020)	Influence Of Intellectual Capital, Income Diversification on Firm Value Of Companies with Profitability Mediation: Indonesian Banking	Intellectual Capital (VAIC)	Profitability (ROA, ROE)	Sig. (+)	The result illustrates that when the intellectual capital increases, then profitability becomes increasing. Firm's intellectuality, knowledge, utilization of information and experience possessed by human resources can be a competitive aspect. The management process, the firm's operational activities, decision making and policymaking are carried out by human resources. With knowledge, intelligence and experience possessed by human resources can become competitive advantage that enhance value and differentiate the firm itself from competing companies. The firm's potential, both human capital and structural capital, can be well managed so that creating value-added for the firm can increase its profit; hence, profitability increases.
			Income Diversification (ID)		Sig. (-)	The test results can be explained that income diversification has a negative effect on profitability. The firm's income diversification increases,

Table 2.4 The summary of relationship between intellectual capital and firm performance (Cont.)

No.	Author	Title	Independent Variable	Dependent variable	Result	Findings
						followed by decreased profitability. To explain further, this can be due to the profit gained from non-interest business activities cannot close the expenditure incurred from the declining bank interest rate.
			Intellectual Capital	Firm Value (PBV)	Sig. (+)	The test results indicate that intellectual capital has a positive effect on firm's value. To increase the firm's capacity, this can be achieved by investing in intellectual resources (especially in human capital, which is an important aspect in value creation these days) and increasing the mobilization of the firm's inherent potential, especially intangibles
			Income Diversification (ID)		Not sig.	The test results illustrate that income diversification does not affect firm's value.

Table 2.4 The summary of relationship between intellectual capital and firm performance (Cont.)

No.	Author	Title	Independent Variable	Dependent variable	Result	Findings
14.	Hejazi et al. (2016)	Intellectual, Human and Structural Capital Effects on Firm Performance as Measured by Tobin's Q	Intellectual Capital (VAIC)	Firm Performance as Measured by Tobin's Q	Sig. (+)	The findings of this study confirm that there was a positive relationship between human and intellectual capital and performance, specifically Tobin's Q. It suggested that intellectual capital should be considered as a means to enhance the performance of Iranian firms. Furthermore, the value-added intellectual coefficient proves to be a valuable tool for decision-makers in Iran's capital market. The results and discussions presented in this paper may be valuable to managers and stakeholders in the capital market also highlighted that intellectual capital played a crucial role in generating value in the contemporary economy.

Table 2.4 The summary of relationship between intellectual capital and firm performance (Cont.)

No.	Author	Title	Independent Variable	Dependent variable	Result	Findings
15.	Alnsour et al (2021)	Intellectual Capital and Tobin's Q as a Measure of Bank Performance	Intellectual Capital (VAIC)	Firm Performance as Measured by Tobin's Q	Sig. (+)	The results indicate a significant impact of the (VAIC) on the financial performance of commercial banks in Jordan. It is recommended that the VAIC model be utilized to assess the financial performance of commercial banks. Additionally, the researchers encourage banks to increase their investments in Intellectual Capital components, modern technology solutions, and infrastructure in order to achieve higher added value for the company. The findings of this study have several implications. Firstly, managers can enhance the profitability of their banks by implementing this method as a means of managing Intellectual Capital. In addition, considering the positive association between human capital and the advancement of firms, managers should prioritize their focus on human resources and strive to foster the growth of their knowledge, skills, and capabilities.

Table 2.4 The summary of relationship between intellectual capital and firm performance (Cont.)

No.	Author	Title	Independent Variable	Dependent variable	Result	Findings
16.	Phromsuwansiri et al. (2022)	The Efficiency of Intellectual Capital on the Performance of Listed Companies in the Stock Exchange of Thailand of the SET100	Intellectual Capital (VAIC)	Firm Performance 1) ROA 2) ROE 3) Net Profit Margin	Not sig. (-) with IC	The value added gained from three factors of IC itself, shows no relationship with firm performance. Only capital employed has relationship with firm performance measured by ROA and ROE at the statistical significance at 0.01. This presents utilizing firm's tangible assets has the importance in value creating and firm performance.
17.	Sucena et al. (2022) (Interview Survey)	Intellectual Capital and Performance: A Case Study of Construction Companies	Intellectual Capital Management model	The development of companies in the civil construction area and how it reflects, whether positively or negatively, relative to its most direct competitors.		This study's findings present that intellectual capital management influences the firm performance among construction firms. By recognizing the importance of intellectual capital management in terms of its influence on firm performance, this can develop a set of investments in human capital that will become structural capital through transferring their competencies, lastly, relational capital. Thus, higher performance can be achieved without losing the acquired knowledge for years.

Table 2.4 The summary of relationship between intellectual capital and firm performance (Cont.)

No.	Author	Title	Independent Variable	Dependent variable	Result	Findings
18.	Sietas et al. (2022)	INTELLECTUAL CAPITAL, FIRM PERFORMANCE AND PRESIDENT DIRECTOR LEVEL OF EDUCATION AND SPECIALIZATION	Intellectual Capital (VAIC)	Firm Performance; ROA	Sig.(+)	This shows that intellectual capital can stimulate firm performance. With effective administration of each capital such as Human Capital, Structural Capital, and Employed Capital, these components can generate the firm's added value, one of which is firm's profit. The increase in earnings from state-owned firms, which are state-owned firms, will also increase the state revenue. This study's results also follow the Resource-based Theory by Wernerfelt (1984) who stated that resources, such as intellectual capital, can boost firm performance and create competitiveness. With the nature of valuable, rare, and inimitable resources, the firm will get more opportunities than its competitors.
19.	Costa et al. (2022)	The impact of investment in intellectual capital on firms' profitability	Intellectual Capital (VAIC)	Future performance 1) ROA 2) ROE		The results indicate a positive effect of investment in intellectual capital on the performance of Brazilian firms. Additionally, all intellectual capital components are significant in increasing return on assets and equity. Intellectual capital is a fundamental basis for firm 's profitability.

Table 2.5 The summary of variable intellectual capital and firm performance

Author	Independent variable;	Dependent variable; Firm Performance													
	VAIC™	MVAIC	Return On Asset (ROA)	Return On Equity (ROE)	Tobin's Q	Return on investment	Market-to-book value ratios of equity (M/B)	Productivity as measured by returns on assets turnover (ATO)	Market valuation	Revenue growth (RG)	Employee productivity (EP)	Net profit margin (NPM)	Firm's value price-to-book value (price value/book value)	Market price per share/earnings per share (PER)	Financial stability; Z-Score
Thamprasart (2014)	✓		✓	✓	✓							✓	✓		
Nimtrakoon (2015)		✓	✓						✓			✓			
Kamath (2015)	✓		✓				✓	✓		✓					
Hejazi et al. (2016)	✓				✓										
Ulum et al. (2017)		✓	✓	✓			✓							✓	
Fahimi and Fakhari (2017)	✓			✓										✓	
Rochmadhona, et al. (2018)	✓		✓			✓									
Rashid, Ziazi and Noreen (2018)	✓		✓	✓									✓		
Thamprasart and Phajongwong (2018)	✓		✓	✓	✓										
Jaroenthip (2018)	✓		✓	✓						✓	✓				
Onumah and Duho (2018)	✓		✓												✓
Oppong and Pattanayak (2019)	✓							✓			✓				
Primasari (2019)	✓				✓										
Yustyarani and Yuliana (2020)	✓		✓										✓		
Alnsour et al. (2021)	✓				✓										
Kurniawan and Muharam (2021)	✓		✓												
Phromsuwansiri et al. (2022)	✓		✓	✓								✓			
Sietas et al. (2022)	✓		✓												
Costa et al. (2022)	✓		✓	✓											

2.7 The Association Between Sustainability Performance and Firm Performance

Firms having a high concern in sustainability practices may increase financial performance by return on assets, profits before tax, and cash flow from operations. There was a bi-directional association between corporate sustainability practice and corporate financial performance (Ameer and Othman, 2012). The competitive advantage, which cannot be imitated, may improve the firm's innovation and profitability. The firms gained an advantage from attention to corporate responsibility activities through four items namely cost reduction, competitive benefit, developing reputation, and legitimacy. Productive and dependable contracting with suppliers, employees, and creditors also led to a decrease; hence, raising the return on assets. Similarly, the firm social performance and lower cost of equity capital were a result of the effectiveness of corporate social performance.

A Firm's sustainability practice and efficiency are related to each other in many ways. Profitability becomes higher when a firm discloses sustainability in the topic of social and environmental concerns. Maletic et al., (2015) found a relationship between sustainability practice and firm performance both in accounting and marketing firm performance which could support a firm's innovation and competitive advantage (Poowadin et. al., 2018). Moreover, Hodkum and Chanruang (2017) studied sustainability disclosure following the GRI-G4 Standard in terms of economic area and found that there was a positive relationship with the market value measured by Tobin's Q which this disclosing followed the rules of data disclosure of the Stock Exchange of Thailand. Economic information disclosure is an important factor that may affect decision-making and related investment which is following Primasari (2019) who found that the intellectual capital disclosure in sustainability reporting enhanced the firm's value measured by Tobin's Q since it was obvious, and transparent to investors and then increased profitability (Bansal et. al., 2021; Setiany, 2021). Additionally, Buallay (2022) described that the level of ESG had the same direction as firm performance, any firm disclosed the excellent relationship between the firm itself and its employees tended to attract more potential staff to work with them. Hence, sustainability disclosure fulfills stakeholders' needs which will later have a positive influence on firm performance which is in accordance with the legitimacy theory and stakeholder theory.

Additionally, Lourenço & Branco (2013) found that leading firms with corporate sustainability performance in Brazil are significantly larger and have a larger return on equity compared to their counterparts. This finding is consistent with previous findings for American firms. A larger market increases more transactions that lead to more profitability of negative events. Those leading firms also have significantly lower ownership concentration and are more likely to gain international listing status compared to their counterparts. In terms of their management, this seems to show more sensitivity to social problems when the owner is more distributed, and ethical investors or social funds are more likely to take part in their decision-making processes. Sustainability was a driver of innovation and competitive advantage.

However, a firm's financial performance encouraged a firm's decision to develop its performance in sustainable operations such as environmental, labor, and product responsibility dimensions. Moreover, the firm was aware of improving the sustainability performance and developing the financial performance since these actions could guarantee its persistence in long-term operation (Wagner, 2010; Poowadin,2016; Jan et al., 2019). Corporate sustainability and financial firm performance were both influenced by institutional pressure through institutional theory and stakeholder theory. According to the research by Weber (2017), the institutional pressure, motivated by the Green Credit Policy Guidelines of Chinese Banks, influenced both corporate sustainability and financial performance. The firm's higher sustainability performance influenced by institutional pressure was positively significant to the financial performance of Chinese banks and that was in line with the good management theory.

The profitability was negatively affected by the disclosure of sustainability reporting; the indication of high profitability was the firm's success. While, the information of non-financial statements would be more emphasized than the height profits of the company (Sinaga & Fachrurrozie, 2017). According to the Legitimacy theory, when firms have high profitability, they always report their financial achievement. However, when they have low profits, they tried to communicate only good news about corporate performance to the investors and so on.

The non-association among firms' financial performance measured by return on equity was not statistically significant with voluntary disclosure (Chau & Gray, 2002;

Michelon & Parbonetti, 2012). Regarding the research of Siew, Balatbat & Carmichael (2013), the association between the financial performance of construction firms in Australia and their sustainability report measured by ESG scores was found at a low level. Nevertheless, the construction firms which issued non-financial reporting mostly outperformed those that were not in the number of selected financial ratios. Hence, it is to say that the ESG scores may not reflect the real non-financial practices of firms. Besides, non-financial reporting may not be concise enough for readers to understand their operational performance. It is similar to Allegrini and Greco (2013), Haji and Anifowose (2016) found firm's financial performance was not significantly associated with sustainable reports. Moreover, there was no association related to the level of sustainability reporting, and the non-relationship was also found by Ganesan et al. (2017). In summary, the findings of the studies involving sustainability reporting and firm performance provide support to the view that there is evidence of improved firm performance arising from sustainability reporting.

Furthermore, there are a lot of researchers who did not find any significant relationship between accounting firm performance and sustainability disclosure; however, some studies found a low level of a significant relationship. In other words, ESG scores cannot reflect enough non-financial data; furthermore, the data seems to be confusing which is difficult to understand clearly (Haji and Aniflowose, 2016; Gansesan et. al., 2017). This is in accordance with Pinta (2016; p.122) who explained that sustainability reporting did not affect firm performance. Sustainability reporting or social responsibility reporting did not reflect in the executive's and shareholders' views. Besides, the short period of reporting and data collecting could make no effect. Furthermore, Carvajal and Nadeem (2022) did not find any significant relationship between sustainability reporting and firm performance measured by Tobin's Q.

From the literature review, the trend of sustainable development or sustainability disclosure has driven all sectors to pay great attention to sustainability such as the economy, society, and environment. It has become the direction for organizational development throughout the world. Firms listed on the Stock Exchange of Thailand (SET) are considered important tools to drive the country's economy. Hence, the SET has encouraged all listed firms to operate their business following the concept of

sustainability to respond to stakeholders' expectations through the sustainability report (SR). Since the sustainability report is the report that presents facts or information about these operating firms that may have both positive and negative impacts on the economy, society, and environment. Therefore, the firm's report should present those effects as well. Only reporting a firm's finance is not enough to respond to the expectations of investors, customers, communities, and stakeholders (Thaipat Institute, 2015).

In brief, the findings of related studies involving sustainability reporting and firm performance provide significant support to the view that there is evidence of improved firm performance resulting from sustainability reporting. This research aims at studying the relationship between the sustainable performance of firms listed on the Stock Exchange of Thailand by evaluating the disclosure of sustainability following the GRI standards which the worksheet has been readjusted for disclosing as mentioned in topic 2.2 to assess the level of disclosure that affects the efficiency of firms (Pinta., 2016; Hodkum & Chanruang; 2017; Bansal et al., 2021; Buallay, 2022).

Table 2.6 The summary of relationship between intellectual capital and firm performance

No.	Author	Title	Independent Variable	Dependent variable	Result	Findings
1.	Wagner (2010)	The role of corporate sustainability performance for economic performance: A firm-level analysis of moderation effects.	Corporate sustainability performance index	Tobin's q	Sig. (+)	Corporate sustainability, when determining economic performance at the firm level, is moderated by the differentiation focus and advertising intensity of a firm. This links with extant work linking differentiation strategies and reputation building based on social responsibility.
2.	Ameer and Othman (2012)	Sustainability Practice and corporate financial performance: A study based on the top global corporations	Sustainability Evaluation Checklis	1. Sales growth 2. ROA 3. Profit before tax 4. Cash flows from operating activites (CFO)	Sig. (+)	The statistical results confirmed that that companies which placed emphasis on sustainability practices had higher financial performance measured by return on assets, profit before taxation, and cash flow from operations compared to those without having such activities. The findings indicate that such strategies related to a debate on 'the worthiness of investing a corporation's resources to become 'more responsible' in the eyes of the stakeholders' have been proven as in the interests of the corporation and therefore, ultimately in the best interests of shareholders, the legal owners.

Table 2.6 The summary of relationship between intellectual capital and firm performance (Cont.)

No.	Author	Title	Independent Variable	Dependent Variable	Result	Findings
3.	Siew, Balatbat and Carmichael (2013)	The relationship between sustainability practices and financial performance of construction companies	The guidelines published by FSC and ACSI (2011)	Profitability; 1. ROA 2. ROE 3. ROIC 4. EBITDA 5. NOPLAT		There is no strong positive correlation between the extent non-financial practices and financial performance within the construction industry
4.	Hodkum and Chanruang (2017)	The Study of Relationship Between the Level of Sustainability Report Disclosure and Security Prices of listed Companies in the Stock Exchange of Thailand	The level of sustainability report disclosure	Security Prices	Sig. (+)	This research's findings show that the level of sustainability report disclosure is positively related to the security prices of listed firms on the Stock Exchange of Thailand. Additionally, the level of sustainability report disclosure based on economics is positively related to the security prices, the level of sustainability report disclosure in terms of social is not related to the security prices, and the level of sustainability report disclosure in terms of environment is not related to the security prices.

Table 2.6 The summary of relationship between sustainability disclosure and firm performance (Cont.)

No.	Author	Title	Independent Variable	Dependent variable	Result	Findings
5.	Poowadin (2016)	The effect of corporate sustainabilty disclosure on financial performance in Asean countries	Sustainability disclosure	1.ROA 2.ROE 3.Net sales	Sig.(+) Sig.(+) Sig.(+)	The analysis of ROA was related with each indicator in level of environmental and product responsibility. The result shows that return on equity was found to be significant with environmental. The result of net sales, it was found that each indicator related to net sales with relation to labor with environmental disclosure. The research indicates that company's financial performance supports a company's decision to improve its performance in managing sustainability performance, along environmental, labor and product responsibility dimensions. Companies should recognize that improving sustainability performance is as significant as improving the financial performance in order to ensure its survival in the long-run, firm needs to be concerned with the needs of the future generations in running the business. environment in which they live, as well as the growth of the business.

Table 2.6 The summary of relationship between sustainability disclosure and firm performance (Cont.)

No.	Author	Title	Independent Variable	Dependent variable	Result	Findings
6.	Pinta (2016)	Effects of Sustainability Report on Organization Performance: A Study Based on Listed Companies in ASEAN.	Sustainability report of DJSI group Sustainability report of Non-DJSI group	Organization Performance 1. Net profit margin 2. ROA 3. ROE	 Not sig. (+) Not sig. (+) Not sig. (+)	Sustainability disclosure is found to have no any effects on firm performance. This can be assumed to happen since it is at the early stage of favor among firms listed on the Stock Exchange in ASEAN countries. Hence, this could not enhance the favor or the importance of sustainability disclosure among executives or shareholders. Furthermore, having short period (one year) of data assessment does not show any significant differences. In addition, these research samples have just been accepted as members of Dow Jones Sustainability Index; hence, above analysis is the explanation to a clue of having non-significant effects on firm performance.

Table 2.6 The summary of relationship between sustainability disclosure and firm performance (Cont.)

No.	Author	Title	Independent Variable	Dependent variable	Result	Findings
7.	Poowadin et al. (2018)	Relationship Between Corporate Sustainability Disclosure and Financial Performance In Thailand	The sustainability disclosure information using GRI G3 and G4 guidelines	Corporations' financial performance 1. ROA 2. ROE 3. Net sales	 Sig. (+) Sig. (+) Sig. (+)	The result indicates the positive significant relationship between the level of corporate sustainability disclosure. All measurements of corporation's financial performance are also presented. The results can be used to encourage firms to contribute in sustainability reporting. Besides, there are more business cases to manage this mandatory corporate sustainability reporting.
8.	Setiany (2021)	The Influence of Intellectual Capital And Environmental Disclosure On Firm Value	Environmental disclosure Intellectual capital elements as a proxy by VACA, VAHU, STVA, RCE	Firm value is measured using Tobins'Q	Not sig. (+) with VACA and not sig. (-) with VAHU, STVA while sig. (+) with RCE Sig. (+)	The results of this study indicate that the elements of intellectual capital including VACA, VAHU and STVA do have any effects on firm value, while RCE and environmental disclosure do have a significant effect on firm value. This can be explained that if a firm is able to maintain good relations with its partners and disclose its environmental information, it tends to encourage stakeholders' trust resulting an increase of the firm's value.

Table 2.6 The summary of relationship between sustainability disclosure and firm performance (Cont.)

No.	Author	Title	Independent Variable	Dependent variable	Result	Findings
9.	Jan et al. (2019)	The nexus of sustainability practices and financial performance: From the perspective of Islamic banking	Sustainability Practices	Firm financial performance		
			1. Economic sustainability	1. Management's perspective ROAA	Sig. (+)	From a management perspective, this situation is reducing the pressure of shareholders demands of not spending their money on sustainability initiatives, and it is allowing management to continue their sustainability initiatives because the interests of both parties are converging on the same understanding of improving sustainability practices for getting higher financial value and shareholders value. It is further challenging them to improve the financial performance of the management itself.
			2. Environmental sustainability	2. Shareholders' perspective ROAE	Sig. (+)	From a management perspective, this situation is reducing the pressure of shareholders on their policies of sustainability initiatives. Because their interest at this certain point is converging. In short, it is giving freedom to the management to prudently invest in sustainability practices for improving their shareholder's value.

Table 2.6 The summary of relationship between sustainability disclosure and firm performance (Cont.)

No.	Author	Title	Independent Variable	Dependent variable	Result	Findings
			3. Social Sustainability	3. Market's Perspective Tobin's Q		
			4. General Standard Sustainability Disclosers	4. Analyzing three financial performance	Sig. (+)	It encourages the management, shareholders, and market investors to take efforts to improve and safeguard sustainability because improvement in sustainability practices will add financial values to the management, shareholder and the market profile of the Islamic banks in Malaysia and vice versa
10.	Primasari (2019)	Intellectual Capital and Sustainability Report Disclosure Toward Company Values Analysis	The sustainability report disclosure measured by SRD	Tobin’s Q	Sig. (+)	The sustainability report disclosures encourage an increase of firm value by Tobin’s Q. The results show that the disclosure of intellectual capital in the sustainability reporting began to increase. Disclosure of the economic dimension in the sustainability report will increase corporate transparency which can influence investors' confidence.
			Intellectual capital measured by VAIC		Sig. (+)	The results of this study indicate that effective and maximum management in the usage of intellectual capital has been proven to increase the firm's value measured by Tobin's Q. The results of this study are in line with resource-based theory which states that firms will gain competitive advantage by utilizing their resources, including intellectual capital, both employees, physical assets, and structural capital.

Table 2.6 The summary of relationship between sustainability disclosure and firm performance (Cont.)

No.	Author	Title	Independent Variable	Dependent variable	Result	Findings
11.	Bansal et al. (2021)	The sustainability reporting-firm performance nexus: evidence from a threshold model	ESG disclosure; Bloomberg index that combines the CSR disclosure (SD), Corporate governance disclosure (GD) and Environmental disclosure (ED)	Firm performance		
				1. ROA	Sig. (+)	When the firm's ESG activities increase, it positively affects its operating performance. It supports value-creation theory, where a firm's social investment assists the firm itself to have higher business efficiency, then this positively influences their operating performance.
				2. ROE	Not sig. (+)	Even firms have invested in social activities, this does not result in higher financial performance. In fact, investing in social activities adds a firm's cost, which increases financial problems; hence, this is to say that investing in social acitivities does not enhance profitability as expected.
				3. Tobin's Q	Sig. (+)	Firms invested in social activities tend to be positively perceived by the market participants, and hence, they are satisfied with higher market performance. It indicates that market participants such as investors think the firms' social investment as the efficiency of operation, hence pay more attention on firms with higher ESG.

Table 2.6 The summary of relationship between sustainability disclosure and firm performance (Cont.)

No.	Author	Title	Independent Variable	Dependent variable	Result	Findings
12.	Buallay (2022)	Toward sustainability reporting in the MENA region: the effects on sector's performance	Environmental, social and governance (ESG) score	Performance 1. ROA	Sig. (+)	First of all, from the slope coefficients of ESG for ROA, these illustrate that the impact of ESG can be found positively in energy sector, manufacturing sector, retail sector and tourism sector as evidenced by coefficients and the p-values of less than 5%. The outcome confirms that the positive relationship between sustainability reporting and operational performance assists the intuitive supposition, which satisfies the needs of internal stakeholders (i.e., employees and management) and raises firm performance by strengthening the relationship among employees and improving employee motivation and loyalty. Second, retail and manufacturing outcomes explain the positive relationship between ESG and ROE. This can be explained that ROE generated by disclosing ESG information exceeds its costs in these sectors. Moreover, it finds that there is the positive relationship between sustainability reporting and financial performance in which supports the intuitive supposition that satisfies the needs of shareholders and raises a firm's financial
				2. ROE	Sig. (+)	

Table 2.6 The summary of relationship between sustainability disclosure and firm performance (Cont.)

No.	Author	Title	Independent Variable	Dependent variable	Result	Findings
				3. Tobin's Q		Third, market performance is found to be varied with ESG reporting in five sectors out of seven namely manufacturing, banks and financial services, retail, telecommunication and information technology and tourism sectors. The stock price or market value of a firm is seen to be the most effective way in enhancing a firm's value. Any non-financial objectives will be detracted from the bottom line of the firm, minor negative effects of ESG on market return indicate that ESG spending is ineffective.
	Carvajal and Nadeem (2022)	Financially material sustainability reporting and firm performance in New Zealand	Sustainability reporting	Financial performance 1. ROA 2. ROE 3. Tobin's Q	 Sig. (+) Not Sig. (+) Not Sig. (-)	Sustainability disclosure is positively associated with firm performance in New Zealand, only when ROA is used as a proxy of firm's financial performance. This finding suggests that firms disclosing its sustainability information tend to have better firm's financial performance which is consistent with the legitimacy and stakeholder theories. This positive association becomes stronger when the firms disclose their financial material information as defined by the SASB.

Table 2.7 The **s**ummary of variable between sustainability disclosure used in estimation the effect to firm performance

Author	Independent vaiable							Dependent vaiable; firm performance							
	Environmental disclosure	ESG disclosure	Sustainability Evaluation Checklist	Corporate sustainability performance index	The guidelines published by FSC and ACSI (2011)	Sustainability disclosure	The financial service sectors disclosures index of the Global reporting initiatives GRI	Net profit margin	ROA	Return on equity (ROE)	Net sales	Security Prices	Cash flows from operating activites (CFO)	Growth of sales (GS)	Profit before tax	Tobin's Q
Wagner (2010)				✓												✓
Ameer and Othman (2012)			✓						✓				✓	✓	✓	
Siew et al. (2013)					✓				✓							
Poowadin (2016)						✓			✓	✓	✓					
Pinta (2016)						✓		✓	✓	✓						
Hodkum and Chanruang (2017)						✓						✓				
Poowadin et al. (2018)						✓			✓	✓	✓					
Primasari (2019)						✓										✓
Jan et al. (2019)							✓		✓	✓						✓
Bansal et al. (2021)		✓							✓	✓						✓
Setiany (2021)	✓															✓
Buallay (2022)		✓							✓	✓						✓
Carvajal and Nadeem (2022)						✓			✓	✓						✓

2.8 The effect of Intellectual Capital on Firm Performance Moderated by Sustainability Disclosure

According to Passetti, Tenucci, Cinquini & Frey (2009) stated the most reported category of intellectual capital voluntary disclosure over time was human capital disclosure, relational, and organizational capital as followed. The highlight quality of intellectual capital voluntary disclosure was non-financial, quantitative, and non-time specific terms, and also forward-looking information had the lowest level of disclosure. The result found the process of social and sustainability disclosure affected the relationship between intellectual capital and the CSR process. Additionally, corporate social responsibility activities had a positive effect on intellectual capital management as they contributed to creating and strengthening intangible resources and company capabilities. It was consistent with the Resource Based View theory which was a beneficial framework that emphasized the importance of intangible resources and competence and discussed the relationships between two areas. Additionally, Bayburina & Golovko (2009) explained that a firm's intellectual capital and its elements related to firm resources were organic growth. It was also a part of the accumulated value constructed through the operation of the accumulated intellectual capital items. Additionally, it had been the long-term value growth to preserve sustainable development. It can be said that it was an "intangible safety cushion" employed by firms that had been created many years before and pointed to sustainable development in the future.

The elements of intellectual capital, which are human capital, structural capital, and relational capital enhanced the environmental training, information, and awareness session assisted in the accretion and application of knowledge. According to the sustainable relational intellectual capital issue, it was found that the link to the firm environment was vital (López-Gamero, Zaragoza-Sáez, Claver-Cortés, & Molina-Azorín, 2011). It was consistent with Cinquini, Passetti, Tenucci, and Frey (2012), the result showed that human capital was the most reported disclosure in a sustainability report and followed by relational capital and organizational capital in 37 Italian-listed firms in two years (2005-2006).

Martínez García de Leaniz and Rodríguez del Bosque (2013) stated that economic, social, and environmental areas had a positive influence on relational capital. Firms were encouraged to explore how corporate sustainability and reputation activities could be processed jointly since firms may handle these concepts in separate management areas. Economic sustainability was critical to be the most crucial element to enhance corporate relational capital.

Intellectual capital voluntary disclosure mainly showed non-financial, quantitative, and non-time-specific terms, while sustainability reports delivered a type of intellectual capital voluntary disclosure detail that can be used by stakeholders to obtain beneficial information on firm activities and performance. It can be said that knowledge of human needs in the firm led to the improvement of sustainable IC, due to it being incorporated into what the members expect from the future. Moreover, IC, which was constructed based on knowledge about needs, might have a natural impact on anyone who concentrated on the operation of obvious needs (Kaiser, Kragulj, & Grisold, 2016).

Thus, the concept of GRI guidelines to implement the sustainability report, specifically G3, is considered as the assistance to develop intellectual capital disclosure. When the level of GRI guidelines became intense, IC disclosure in sustainability reports became higher. Stakeholders were considered a source of wealth; hence, firms built positive reputations and images (Oliveira, Lima & Craig, 2010). Furthermore, the GRI standard has certain indicators that can be used as guidelines to implement the sustainability report or strategies plan on the topics of human rights, employees' training programs, welfare, and other benefits (Bananuka et al., 2021). The standard of sustainability implementation, such as the GRI standard, assists the reporting process to be more concise. Firms that pay high attention to stakeholders tend to increase their reliability and gain trust by reporting intangible assets management; intellectual capital and knowledge management on building competitive advantage (Arshad et al., 2016; Thiagarajan & Sekkizhar, 2017)

Utama and Mirhard (2016) described that intellectual capital information can be found in a firm's annual report sustainability report (SR) and its website. Intellectual capital had the advantage to fulfill the gap between the management team and shareholders. The stakeholders tended to read the annual report compared to others and

some of the additional information on intellectual capital might be found in the annual report and its website. Intellectual capital disclosure could motivate the satisfaction of stakeholders. Regarding Global Report Initiatives (GRI), sustainability reporting is a report published by a firm that consists of economics, environmental, and social impacts/influences caused by its activities. The result showed the moderating regression analysis that sustainability disclosure had a positive effect on firm performance which was measured by ROA and ROE. Firms should increase the disclosure of sustainability reports because of the intangible advantages and disturbed about the IC fragments (human capital, SC, and relation capital or capital employed) because these could lead to better company performance. Moreover, Sim-im et al. (2019) found that intellectual influenced sustainable growth rate caused by human capital. This human capital had the same direction of the relation towards the firm's sustainable growth rate. Besides, having a high growth rate could indicate a firm's financial status at a certain time which assisted executives to evaluate the firm's performance and prepare its future strategies. Moreover, having too rapid or too slow a growth rate could reflect a firm's disorder or errors. If the executives understood this concept, this would enable proper investment that leads to sustainable growth. Any firm that emphasized intellectual capital, especially in human capital such as investing in individuals, developing employees' skills, and training to encourage employees to create innovation and developed their skills, would have an advantage leading to the sustainable growth of the firm's performance.

Massaro and Dumay (2018) described that human capital became the main element of intellectual capital that supported sustainability reporting. Nakyeyune et al. (2022) found that financial firms tended to have skilled human resources which can be considered human capital. Those employees who participated in sustainability reporting could prepare the report following the GRI standard. Another important point was firmed also could maintain their elements of intellectual capital; human capital, structural capital, and capital employed regarding the resource-based view theory. Bananuka et al. (2021) explained that the level of intellectual capital affects the ability to implement sustainability reporting based on the GRI standard. The stakeholder theory indicates that it is expected to support and provide information assisting stakeholders; hence, investors

are more careful with their investments in which they consider more details from other financial reports (Setiany, 2021).

As mentioned, intellectual capital and sustainability reporting are both related to firm performance since firms must disclose their information following the stakeholder theory and the legitimacy theory which are mandatory and follow the stakeholders' expectations. Moreover, it is vital to maintain resources such as intellectual capital to be more advantageous than competitors regarding the resource-based view theory, then leads to higher firm performance. In general, most researchers used questionnaires to collect data to analyze the relationship between intellectual capital, sustainability disclosure, and firm performance. However, this study aims at using the paperwork to collect data that can reflect the transparency and details in sustainability disclosure for readers or investors. Hence, this leads to hypothesis 2 as follows;

Research Hypothesis 2: Sustainability disclosure moderates the relationship between intellectual capital and firm performance such that the effect of intellectual capital and firm performance is stronger when firms possess high sustainability disclosure than when firms possess low sustainability disclosure of listed firms on the Stock Exchange of Thailand.

CHAPTER 3
RESEARCH METHODOLOGY

The construction of this chapter is concluded as follows; first, the conceptual model framework is introduced in the literature review. Second, the research design consists of the population and samples and the variable measurements measure dependent variables, mediating variables, and independent variables. Third, the content analysis describes the measurement of sustainability performance. Forth, data analysis is created by using descriptive statistics, reliability analysis, correlation analysis, and qualitative analysis. Lastly, the moderator variables are tested by applying multiple linear regression analysis.

3.1 Conceptual Model

Refers to the research framework and hypotheses in chapter one, this research employed multiple regression analysis. Hence, the statistical research model was constructed for hypothesis testing as follows;

The model was employed to investigate the relationship of intellectual capital, sustainability performance, competitive advantage, and firm performance.

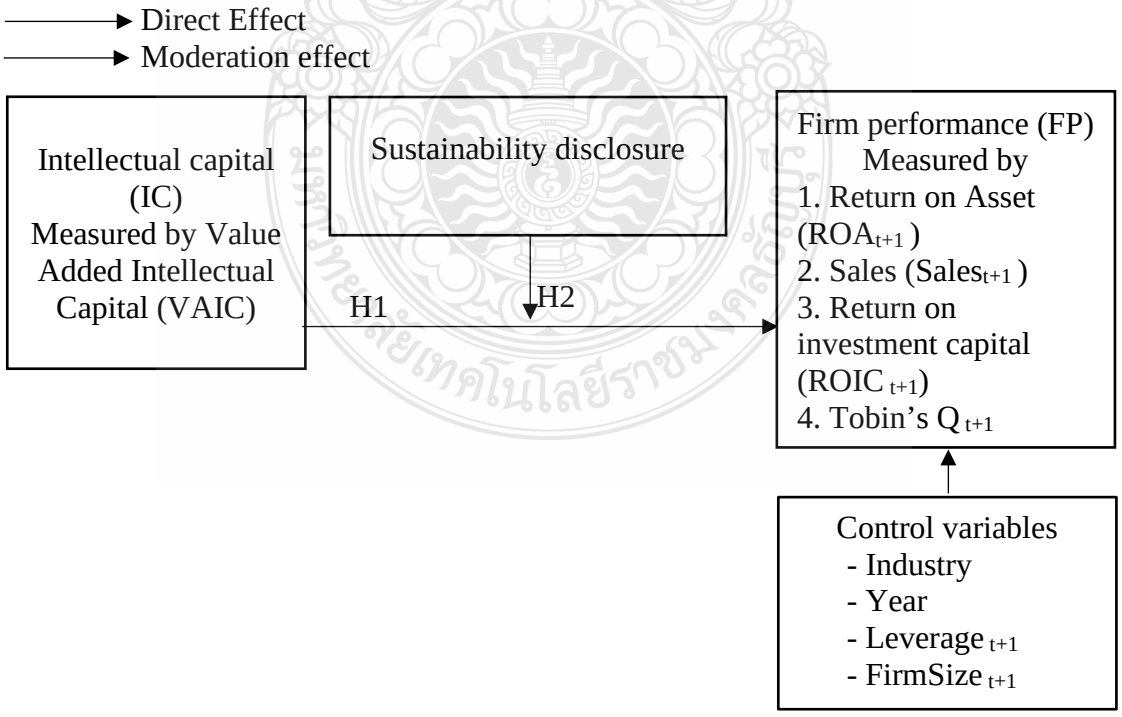


Figure 3.1 Conceptual model

3.2 Research Design

This research was cross-sectional observed from according to the population or research samples taken from the Stock Exchange of Thailand (SET) and SETSMART data which was the secondary data for data collection.

3.2.1 Population and samples

Thai firms listed on the Stock Exchange of Thailand (SET) were chosen for the research by choosing those listed firms that have acquired, improved, and investigated intellectual capital, sustainability, and firm performance. All of the data can be accessed through the firm's annual reports, sustainability reports, and other firm documents.

The total population based on the data of the Stock Exchange of Thailand (SET) was 622 firms; however, five firms under the rehabilitation were excluded from this research regarding financial and operational problems. Those firms in fund and trust were excluded from the samples because the financial reporting requirements and characteristics of business operations were different from other firms. Moreover, 60 financial firms from banking, finance, and insurance were omitted since these firms have distinctive assessments and the nature of assets was significantly different from other industries such as income from interest and liability from the deposit (Attarit, 2016, P.69).

Table 3.1 The population for research (The Stock Exchange of Thailand, 14 September 2020)

Description	Firm	Percent
Population research is listed firms on the Stock Exchange of Thailand (SET) on 14 September 2020	622.00	100.00
Less:		
Power Plant Infrastructure Fund in Resources Industry	(4.00)	(1.00)
Real Estate Investment Trust: REIT firms	(59.00)	(9.00)
Firms in Finance industry	(60.00)	(10.00)
Firms Under Rehabilitation	(5.00)	(1.00)
Total	**494.00**	**9.00**

Table 3.2 Classified industries of SET listed firms (The Stock Exchange of Thailand, 14 -September 2020)

Industry	Firm	Percent
Agro & Food Industry	54.00	11.00
Consumer Products	41.00	8.00
Industrials	92.00	19.00
Property & Construction	100.00	20.00
Resources	53.00	11.00
Services	116.00	23.00
Technology	38.00	8.00
Total	**494.00**	**100.00**

The sample of this research is all firms in the technology industry, agricultural and food industry, and services industry. The number of firms in these industries is shown as follows;

Table 3.3 The amount of samples firm

Industry	Firm	Percent
Agricultural and Food	54	26.00
Services	116	56.00
Technology	38	18.00
Total	208	100.00
Less		
Firms with property fund	(4)	
Missing data	(19)	
Total	**185.00**	**89.00**

The final samples are 185 firms, 49 firms in the Agricultural and Food industry, 100 firms in the service industry, and 36 firms in the technology industry. The name of the sample is shown in Appendix B.

Agricultural and Food Industry industry; all businesses which are mainly related to two fields; Agribusiness and Food and Beverage. Agribusiness is based on agriculture fields, forestry, and wood processing, livestock, fishery including agents or dealers based on distributing agricultural goods (except fertilizer & pesticide business and fiber business). Food and Beverage industry; including food processing into other forms of food, restaurants, and food sellers (The Stock Exchange of Thailand, n.d.). Thaipat Institute found the most top-10-sustainable issues in the agricultural and food industry as follows; Economic Performance, Employment, Product and Service Labeling, Occupational Health and Safety, Training and Education, Energy, Products and Services, Diversity and Equal Opportunity, Water, and Local Communities.

Regarding the part of the sustainable development goals which explains eliminating hunger, the wealth of nutrition, improvement of nutrition, and supporting sustainable agriculture, all these topics are issued to be following the Development Plans of Thailand's Economy and Society No. 12 (Years 2017-2021). The plan is focusing on supporting Thai agriculture to achieve the sustainable development goals which are explained as follows; to encourage the development of innovation to increase and enhance the efficiency of manufacturing products and services, to encourage and develop the biological economy as the new source of revenue, develop the risk management, preparation for changeable local weather which all of these are for farmers' wealth and stability, to differentiate Thailand's products in terms of quality and safety following the world standards. To increase the potential of Thai industries by using innovation effectively also to build awareness of the green environment, and to strengthen the financial organizations and the co-operative organizations to be able to support Thai farmers.

Technology industry; all businesses which are related to the field of technology including a primary phase, middle phase, and final phase. These are service providers in Information Technology and Telecommunication such as electronic component manufacturers (IC PCB semiconductor); except computer components, Telecommunication Service Providers (satellites and cables) including related IT and Internet Services, Main Computer Servers, IT Components Manufacturers and Sellers, Software Developers (The Stock Exchange of Thailand, 2016).

Organizations' sustainability performance is believed to show a positive influence on technologically innovative performance at some periods. The impact of sustainability on technological innovation performance seems to be higher than the reciprocal effect generated from technological innovation performance. The sustainability performance significantly affects itself, positively over different periods. The same positive trend is significant for technological innovation performance over different periods. These positive impacts are consistently observed in different periods; short, mid, and long terms. Organizations in the high-tech and medium-high-tech industries have also been investigated and the result shows statistically significant impacts only in the short-term period test. These industries spend a much greater annual effort on encouraging technological innovation performance, as well as increasing productivity in innovative outputs rather than any other industries. However, they may not need to utilize resources to sustainably develop themselves as indicated by WCED, especially in the mid to long term (Spencer et al., 2013).

Services industry; all businesses are listed in the service industry excluding financial, information and technology, and some businesses that have already been listed in other fields; Commerce, Health Care Services, Media and Publishing, Professional Services, Tourism and Leisure, and Transportation and Logistics (The Stock Exchange of Thailand, n.d.). The strategies issued by the Department of Industrial Promotion (DIP) Years 2019-2021; it is issued per the Thailand 20-year National Strategies. This is focusing on increasing the ability for high competition and developing tools to drive Thailand's economy as well as to increase the value to move forwards to the developed country in the future. Hence, it is necessary to create innovation and technology, train more skilled employees, generate a proper ecosystem for industries and services, and support the development of sustainable industries and services.

3.2.2 Data Collection

The quantitative research employed the data from the financial report of Thai listed firms, available on the SETSMART database (the web-based application from the SET) and Set Market Analysis. Other information was accessed from the SET and the firms' websites. The period of collecting data started from 2018 to 2020. The data was

derived from the disclosure of additional information (Form 56-1), the annual reports, and the sustainability report.

3.2.3 Measurement Variables

3.2.3.1 Dependent variables

The financial performance had been widely used to consider firm performance at the early beginning before the Market-based Measures (Tobin's Q) and Market-to-Book Value (MB Ratio) were first used in 1980. Gentry (2010) described that the financial performance and the market-based measure could reflect firm performance differently with different aspects. Thus, this research used four indicators to measure firm performance. This reflected that intellectual capital could increase the value of the firm and affect future firm performance (Jaroentthip, 2018; Costa et al., 2022). Therefore, the dependent variable t+1 was used, after the year t of the independent variable's data (previous accounting period).

(1) Return on Assets (ROA_{t+1}) is one of the indicators to measure firms listed on the Stock Exchange of Thailand. ROA was widely accepted by many researchers who studied the relationship between intellectual capital and firm performance (Ulum et al., 2017; Thamprasart & Phajongwong, 2018; Yustyarani & Yuliana, 2020; Bansal et al., 2021; Buallay, 2022; Sietas et al., 2022; Phromsuwansiri et al., 2022). In addition, this is often used to measure the relationship with sustainability reporting or sustainability disclosure (Utama & Mirhard, 2016; Poowadin et al., 2018; Jan et al., 2019; Phromsuwansiri et al., 2022; Carvajal and Nadeem, 2022). With this ratio, it means the efficiency of firms in utilizing the firm’s assets in any investment to gain net profit following the outcomes, there are details described in many aspects in terms of how much net profit the firm gains and how effective it is. When the ratio is more than 1, this means the efficiency is significant and higher than the firm invested.

ROA_{t+1} = Net Income/Total Assets

(2) Sales ($Sales_{t+1}$) are a key factor to increase a firm’s revenue and profit growth. Therefore, it is essential to measure and develop sales performance to generate a higher return on investment. This study aims to use natural logarithm net sales to reflect a firm’s net income (Peter et al., 1998; Pätäri et al.,2014; Bayoud et al.,2012; Poowadin,

2016). Moreover, an increasing in certain products such as instant noodles or canned food can also reflect whether the economy is in a positive sign.

(3) Return on Invested Capital ($ROIC_{t+1}$)

Comparing Return on Investment the differentiation between successors and losers in value creation is administrating capital invested in assets efficiently. To be a successor, there is the need to focus on not only profit but also invested capital (not to be drowned in the poor investment of assets such as revolving funds and fixed assets to increase its value. The most accepted indicator for making decisions and comparing data is ROIC which can be calculated from Net Operating Profit After Tax (NOPAT) divided by invested capital. Consequently, ROIC can reflect a firm's efficiency in investing capital. Any organization having a high ROIC is accepted broadly. ROIC is the percentage of return on investment that is independent from a firm's size and capital, or the type of business. While EVA is unable to compare firms' values. EVA alters regarding its size and invested capital.

Analyzing Return on Invested Capital (ROIC), there are two factors to be observed; direction and fluctuation. When the value of ROIC is decreasing continuously, it is believed that a firm cannot generate a return to shareholders since it might have been added capital over the limit, had several loans, or encountered an unstable situation in the market. The proper ROIC can be compared with the Weighted Average Cost of Capital (WACC). As explained earlier, when ROIC is higher than WACC, it is positive. In the long run, it tends to increase economic value (EVA) to shareholders. The fluctuation of ROIC occurs when it lacks strategic planning and management, hence; there is a fluctuation in gaining profit and return.

Cusumano, Kahl, and Suarez (2015) divided the source of competitive advantage into four parts; customer relationships, supplier relationships, intellectual property, and fixed asset management, also proved that the mix of all ratios was a representative of the mentioned relationships that formed a new ratio called "Du Pont Identity" or Return on Invested Capital (ROIC). However, Liang and Huang (2011) proved that a firm having a competitive advantage through the light-assets rating model tended to have better performance with the use of ROIC indicators among semiconductor manufacturing firms. The competitive advantage variables are gauged by using the

following formula. However, implementing a business does not only use shares to expand its operation but also uses liabilities as invested capital. Hence, the formula for ROIC calculation is explained as follows;

$ROIC_{t+1}$ = NOPAT / Invested Capital

NOPAT = Net Operating Profit after Tax

Invested Capital; Shares + Long-term Liabilities (Wongbangpho & Mesantasuwan, 2009; Chowichit, 2018)

(4) Tobin's Q_{t+1} is another measurement method developed by Professor James T. Tobin. The market value of the firm's assets is divided by the replacement cost of that asset since the replacement cost reflects the most accurate value and can be invested in any type of investment. If the firm does not gain higher than the replacement cost, the firm should consider investing in other sources. Hence, if Tobin's Q is lower than 1, this means that investment becomes useless and ineffective (Damodaran, 1999; Thamprasart & Phajongwong, 2018, Hodkum & Chanruang; 2017; Primasari, N. S., 2019; Bansal et al., 2021; Buallay, 2022; Carvajal & Nadeem, 2022).

Tobin's Q_{t+1} = (Market Capitalization + Total Debt)/ Total Assets

Where Market Capitalization is the value of assets according to the market price (Setinvestnow, 2020).

3.2.3.2 Independent variable

The intellectual capital efficiency

Value Added Intellectual Coefficient (VAIC) is used to measure the result as it has been widely accepted by many countries since there are many advantages. The result can be compared between industries and countries. This is not complicated to follow since financial data is the source of reliable data and has been verified by auditors (Thamprasart & Phajongwong; 2018, Primasari, N. S., 2019; Yustyarani & Yuliana, 2020; Setiany, 2021). It contains three components: value added capital employed coefficient (VACA), value added human capital coefficient (VAHC), and value added structural capital coefficient (STVA) as follows;

Calculate Value Added Capital Employed coefficient (VACA)

VACA = VA / CA

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

Calculate the Value Added Cuman Capital coefficient (VAHC)

VAHC = VA / HC

HC 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” from the notes to financial statements under the heading “expenses by nature”.

Calculate Value Added Structural Capital coefficient (STVA)

STVA = SC / VA

SC is structural capital, which can be measured from VA – HC

Calculate Value Added Intellectual Coefficient (VAIC)

VAIC = VACA + VAHC + STVA

VAIC is the efficiency of generating business value from the resources of the business consisting of human capital and structural capital, which are the main components of intellectual capital. It also includes physical capital, which is traditional capital on which the company is still dependent or mainly rely on in some countries.

3.2.3.3 The moderator variable

From the literature review, it can be found that most studies chose indicators to measure the disclosure at the international level (Pinta., 2016; Hodkum & Chanruang; 2017; Bansal et al., 2021; Buallay, 2022,). Sustainability disclosure in this research is constructed by the GRI standards guideline (Global Reporting Initiative, 2016) as a checklist. Sustainability disclosure is used as a moderator. A worksheet is created following the GRI standards for measuring the disclosure which there are two types;

(1) Sustainability Disclosure, in which the data of sustainability disclosure was collected based on the GRI Standards by giving ‘0’ or ‘1’ point. Therefore, the highest score is the total scores combining from each indicator and also each industry tested.

(2) Sustainability Disclosure with explicit result weighed with the disclosure of each indicator following the GRI Standards by giving a ‘1’ point if the firm discloses following the GRI standards.

give another ‘1’ point if disclose and show pictures or tables.

give another ‘1’ point if the report is approved by an external committee.

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

3.2.3.4 Control Variables

From the literature review regarding intellectual capital, firm performance, and sustainability reporting. Certain independent variables influence dependent variables or firm performance. Thus, to control the effects of other factors that may have affected dependent factors; hence, it is necessary to choose a control variable.

(1) Types of industry (Thamprasart & Phajongwong; 2018; Jaroentthip, 2018; Setiany, 2021), dummy variables are indicated for studying as follows;

Ind_Agro = 1 If firm is in agricultural and food industry

= 0 If firm is not in other industries

Ind_Tech = 1 If firm is in technology industry

= 0 If firm is in other industries

Indicated “Service Industry” as an industry reference

(2) Types of year, dummy variables are indicated for studying as follows;

Year2019 = 1 If year to collect dependent variable is year 2019

= 0 If year to collect dependent variable is not year 2019

Indicated “Year 2020” as a year reference

(3) Leverage ratio

The 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. High leverage may result firms mainly to focus on meeting the demands of their debtholders. This deviates from the stakeholders’ views assumed by VAIC™. Any firms having high debt tend to have higher obligations to pay interest to debt holders. However, this makes them become less attractive for investors and also highly exposed to the risk of insolvency (Onumah & Duho, 2018; Jaroentthip, 2018; Oppong & Pattanayak, 2019; Costa et al., 2022; Phromsuwansiri et al., 2022).

(4) Firm Size is used for measuring the size of firms, large firms tend to disclose more sustainability than small firms since they have high pressure from stakeholders (Pinta, 2016). Moreover, when examined the level of intellectual capital disclosure, it was found that the size of firms has the relationship as well (Klaewtanong, 2018), in which large firms have advantage in economy of scale especially in information preparation and public propagandize (Lang and Lundholm, 1993). Furthermore, it was assumed that large firms had more potentials in investment of Research and Development (RD) than small firms. Hence, this made large firms disclosed more information on research and development. This research employs the natural log of total assets. According to samples in this research, they have different sizes. Firms' assets will be used to measure the size which are similar to previous studies (Thamprasart, 2014; Nimtrakoon, 2015; Poowadin, 2016; Zahid & Ghazali, 2017; Rashid et al., 2018; Jaroentthip, 2018; Costa et al., 2022; Phromsuwansiri et al., 2022).

3.3 Content Analysis

Content analysis is organized on sustainability reports managed by firms on the Stock Exchange of Thailand to cite corporate sustainability disclosure information. The economy, environment, labor, human rights, social and product responsibility performance information are disclosed in the reports with numerous types and amounts. The content analysis of corporate sustainability reports was found to be constructed by Bowman and Haire (1976) and Ernst and Ernst (1978) who conducted the development of investigations (Trotman, 1979; Trotman and Bradley, 1981; Milne & Adler, 1999). The researchers who combined to develop the content analysis of corporate sustainability reports were as follows; Adams and Roberts (1995), Adams, Hill, and Roberts (1998), Deegan and Gordon (1996), Deegan and Rankin (1996) Jaggi and Zhao (1996) Burritt and Welch (1997), Buhr (1998), Raar (2002), Cunningham and Gadenne (2003), Dissanayake and Xydias (2016), Poowadin (2016).

There are two necessary characteristics required for the content analysis of corporate sustainability reports as follows; 1) the categories were applied to estimate the various types of sustainability performance information that showed in the reports by

determination, 2) a determination also has to be done on the element of analysis apply for estimating the great amount of information that is illustrated for each category.

Considering the categories to apply, Gadenne et al. (2012) and Maletic et al. (2015) used the questionnaire for the measurement of corporate sustainability performance, the structure of the questionnaire was constructed from sustainability exploitation and sustainability exploration and sustainability management practice or sustainability management performance. According to the global indicator, Environment, Social and Governance (ESG) were used by Wang and Sarkis (2013), Weber (2017). Kinder Lydenberg Domini (KLD) was used by Wagner (2010) and Lu (2013), Lourenço and Branco (2013), measured by Bovespa Corporate Sustainability Index (leading corporate sustainability performance firms), Siew et al. (2013) had done by the indicator of Financial Services Council (FSC) and Australian Council of Super Investors (ACSI). The flavor of corporate sustainability performance was Global Reporting Initiative (GRI) conducted by Dissanayake (2016), Jukkawalkul (2016), Poowadin (2016). The difference in categories or the choice in each category to investigate, it is depended on the selection of corporate sustainability reporting frameworks.

The differences in each researcher's view have also been taken in another form, to pointing the unit of analysis to apply. Dissanayake (2016) considered each category by applying a four-point level. Wagner (2010), Lu (2013), and Jukkawalkul (2016) measured the category number of words. Lourenco & Branco (2013), Siew et al. (2013), Wang and Sarkis (2013), Poowadin (2016), and Weber (2017) used the method of giving 0 or 1 to imply, correspondingly, the non-appearance and occurrence of a performance indicator.

The method of counting several words to define each category might reasonably lead to problems such as a little number of words might be employed to show the same amount of incremental information; the greater number of words may not provide available information. The number of pages or paragraphs to identify each category may cause the problem since each page and each paragraph may not consist of the available amount on relevant issues.

The methods such as counting the number of pages, paragraphs, sentences, and words are limited and become a possible problem by applying this unit to the analysis. While the analysis of 0 or 1 has not been stated to be the enticement or the quality

disclosure indicator. However, that is not the goal of this research to estimate the quality of disclosure indicator performance. Hence, the goal of scoring is to emphasize the performance indicator of the GRI Standards version. Firms highlight the indicator and disclosure, the subsidiary of indicator, and also the progress of firm sustainability disclosure that have to be done under the concept of indicators. This research estimates each firm's scores by using the indicators of the GRI Standards version which consists of 1) Universal Standards which have 3 main indicators or 60 question indicators and 2) Topic-specific Standards which have 33 main indicators or 85 question indicators. The criteria for checklist disclosure have been explained in table 3.3 and described in Appendix C.

3.4 Data Analysis

3.4.1 Descriptive Statistics

Descriptive statistics consists of minimum, maximum, mean, frequency, and standard deviation which are applied for data generalization in all variables. Independent variables included intellectual capital (Value Added Intellectual Coefficient; VAIC) variables consisting of the accumulation of, Value Added Capital Employed coefficient (VACA), Value Added Cuman Capital coefficient (VAHC), Value Added Structural Capital coefficient (STVA), and moderator variables are the twice measurement of Sustainability Disclosure (SDINDEX).

1) Mean or average is commonly employed as a method of explaining the central tendency. The estimation is conducted by adding up all values and then dividing by the number of values.

2) Median is the central value data that sets in the middle of the scale, by arranging from less to more value. Hence, there is half of the data (50%) less than the median value, and the other is more than the median value. So, this research can collect data as follows; ordinal scale, interval scale, and ratio scale.

3) Standard Deviation; S.D. or S. is the average of the difference of data and mean. Additionally, how much each data is different from the mean. If the standard deviation is high, it can be assumed that the data is spread out over a wide range of values. When the standard deviation is low, it can be assumed that data tend to be very close to

the mean. Therefore, the researchers tend to conclude the characteristic of data spread out by the standard deviation rather than a variance.

4) The available skewness index is a greater value than 3.0, it might be shown as extremely skewed or not have a normal distribution. If the absolute kurtosis index is more than 10, it shows there is no normal distribution (Kline, 2015). Even though Vanichbuncha (2013) stated the skewness value should be between -1 and +1 to propose a normal distribution.

3.4.2 Quantitative Analysis

The research employed multiple regression at the statistical significance level of 0.05 to analyze the influence of independent variables year 2018-2019 as follows; intellectual capital and controlled variables; industry, year, leverage, firm size, and industries which were expected to affect moderator variables such as sustainability disclosure and dependent variables which are Return On Assets (ROA), Sales, Return On Investment Capital (ROIC), and Tobin's Q of the year 2019-2020. Direct effects were tested by having hypothesizes as follows;

Hypothesis 1: Intellectual capital has the positive relationship with firm performance of listed firms on the Stock Exchange of Thailand.

Hypothesis 1a: Intellectual capital has positive relationship with Return on Assets.

$$ROA_{it+1} = \beta_0 + \beta_1 VAIC_{it} + \beta_2 Ind\_Agro + \beta_3 Ind\_Tech + \beta_4 Year2019 + \beta_5 Leverage_{t+1} + \beta_6 FirmSize_{t+1}$$

Hypothesis 1b: Intellectual capital has positive relationship with sales.

$$Sales_{t+1} = \beta_0 + \beta_1 VAIC_{it} + \beta_2 Ind\_Agro + \beta_3 Ind\_Tech + \beta_4 Year2019 + \beta_5 Leverage_{t+1} + \beta_6 FirmSize_{t+1}$$

Hypothesis 1c: Intellectual capital has positive relationship with Return on Investment Capital.

$$ROIC_{t+1} = \beta_0 + \beta_1 VAIC_{it} + \beta_2 Ind\_Agro + \beta_3 Ind\_Tech + \beta_4 Year2019 + \beta_5 Leverage_{t+1} + \beta_6 FirmSize_{t+1}$$

Hypothesis 1d: Intellectual capital has positive relationship with Tobin's Q

$$\text{Tobin's Q}_{t+1} = \beta_0 + \beta_1 \text{VAIC}_{it} + \beta_2 \text{Ind\_Agro} + \beta_3 \text{Ind\_Tech} + \beta_4 \text{Year2019} + \beta_5 \text{Leverage}_{t+1} + \beta_6 \text{FirmSize}_{t+1}$$

Moderation effects are tested by 2 hypothesizes as follows;

Hypothesis 2: Sustainability disclosure moderates the relationship between intellectual capital and firm performance such that the effect of intellectual capital and firm performance is stronger when firms possess high sustainability disclosure than when firms possess low sustainability disclosure of listed firms on the Stock Exchange of Thailand.

Hypothesis 2a: Sustainability Disclosures (SDINDEX_I) moderates the relationship between intellectual capital and Return on Assets.

$$\text{ROA}_{t+1} = \beta_0 + \beta_1 \text{VAIC}_{it} + \beta_2 \text{SDINDEX\_I}_{it} + \beta_3 \text{VAIC.SDINDEX\_I}_{it} + \beta_4 \text{Ind\_Agro} + \beta_5 \text{Ind\_Tech} + \beta_6 \text{Year2019} + \beta_7 \text{Leverage}_{t+1} + \beta_8 \text{FirmSize}_{t+1}$$

Hypothesis 2b: Sustainability Disclosures (SDINDEX_I) moderates the relationship between intellectual capital and Sales.

$$\text{Sales}_{t+1} = \beta_0 + \beta_1 \text{VAIC}_{it} + \beta_2 \text{SDINDEX\_I}_{it} + \beta_3 \text{VAIC.SDINDEX\_I}_{it} + \beta_4 \text{Ind\_Agro} + \beta_5 \text{Ind\_Tech} + \beta_6 \text{Year2019} + \beta_7 \text{Leverage}_{t+1} + \beta_8 \text{FirmSize}_{t+1}$$

Hypothesis 2c: Sustainability Disclosures (SDINDEX_I) moderates the relationship between intellectual capital and Return on Investment Capital.

$$\text{ROIC}_{t+1} = \beta_0 + \beta_1 \text{VAIC}_{it} + \beta_2 \text{SDINDEX\_I}_{it} + \beta_3 \text{VAIC.SDINDEX\_I}_{it} + \beta_4 \text{Ind\_Agro} + \beta_5 \text{Ind\_Tech} + \beta_6 \text{Year2019} + \beta_7 \text{Leverage}_{t+1} + \beta_8 \text{FirmSize}_{t+1}$$

Hypothesis 2d: Sustainability Disclosures (SDINDEX_I) moderates the relationship between intellectual capital and Tobin's Q.

$$\text{Tobin's Q}_{t+1} = \beta_0 + \beta_1 \text{VAIC}_{it} + \beta_2 \text{SDINDEX\_I}_{it} + \beta_3 \text{VAIC.SDINDEX\_I}_{it} + \beta_4 \text{Ind\_Agro} + \beta_5 \text{Ind\_Tech} + \beta_6 \text{Year2019} + \beta_7 \text{Leverage}_{t+1} + \beta_8 \text{FirmSize}_{t+1}$$

Hypothesis 2e: Sustainability Disclosures with explicit result (SDINDEX_II) moderates the relationship between intellectual capital and Return on Assets.

$$\text{ROA}_{t+1} = \beta_0 + \beta_1 \text{VAIC}_{it} + \beta_2 \text{SDINDEX\_II}_{it} + \beta_3 \text{VAIC.SDINDEX\_II}_{it} + \beta_4 \text{Ind\_Agro} + \beta_5 \text{Ind\_Tech} + \beta_6 \text{Year2019} + \beta_7 \text{Leverage}_{t+1} + \beta_8 \text{FirmSize}_{t+1}$$

Hypothesis 2f: Sustainability Disclosures with explicit result (SDINDEX_II) moderates the relationship between intellectual capital and Sales.

$$\text{Sales}_{t+1} = \beta_0 + \beta_1 \text{VAIC}_{it} + \beta_2 \text{SDINDEX\_II}_{it} + \beta_3 \text{VAIC.SDINDEX\_II}_{it} + \beta_4 \text{Ind\_Agro} + \beta_5 \text{Ind\_Tech} + \beta_6 \text{Year2019} + \beta_7 \text{Leverage}_{t+1} + \beta_8 \text{FirmSize}_{t+1}$$

Hypothesis 2g: Sustainability Disclosures with explicit result (SDINDEX_II) moderates the relationship between intellectual capital and Return on Investment Capital.

$$\text{ROIC}_{t+1} = \beta_0 + \beta_1 \text{VAIC}_{it} + \beta_2 \text{SDINDEX\_II}_{it} + \beta_3 \text{VAIC.SDINDEX\_II}_{it} + \beta_4 \text{Ind\_Agro} + \beta_5 \text{Ind\_Tech} + \beta_6 \text{Year2019} + \beta_7 \text{Leverage}_{t+1} + \beta_8 \text{FirmSize}_{t+1}$$

Hypothesis 2h: Sustainability Disclosures with explicit result (SDINDEX_II) moderates the relationship between intellectual capital and Tobin's Q.

$$\text{Tobin's Q}_{t+1} = \beta_0 + \beta_1 \text{VAIC}_{it} + \beta_2 \text{SDINDEX\_II}_{it} + \beta_3 \text{VAIC.SDINDEX\_II}_{it} + \beta_4 \text{Ind\_Agro} + \beta_5 \text{Ind\_Tech} + \beta_6 \text{Year2019} + \beta_7 \text{Leverage}_{t+1} + \beta_8 \text{FirmSize}_{t+1}$$

Where:

β_0 = constant

β_1-β_{11} = coefficient of the explanatory variables

VAIC_{it} = the independent variable; value added intellectual capital for firm i in year t.

SDINDEX_I_{it} = the moderator variable; sustainability disclosure for firm i in year t.

SDINDEX_II_{it} = the moderator variable; sustainability disclosure with explicit result for firm i in year t.

$\text{VAIC.SDINDEX\_I}_{it}$ = the interaction variable; value added intellectual capital with sustainability disclosure for firm i in year t.

$\text{VAIC.SDINDEX\_II}_{it}$ = the interaction variable; value added intellectual capital with sustainability disclosure with explicit result for firm i in year t.

ROA_{t+1} = the dependent variable; Return On Assets for firm i in year t+1.

Sales_{t+1} = the dependent variable; Net sales for firm i in year t+1.

ROIC_{t+1} = the dependent variable; Return On Investment Capital for firm i in year t+1.

Tobin's Q_{t+1} = the dependent variable; Tobin's Q for firm i in year t+1.

Ind_Agro = the control variable; which is a dummy variable (1 = the company is in the agriculture and food industry, 0 = otherwise)

Ind_Tech = the control variable; which is a dummy variable (1 = the company is in the technology industry, 0 = otherwise)

Year2019 = the control variable; the data of dependent variable occur in year 2019

$Leverage_{it+1}$ = the control variable; leverage for firm i in year t+1. The ratio of total liabilities to total assets

$FirmSize_{it+1}$ = the control variable; the natural logarithm of total asset for firm i in year t+1.

3.4.3 Testing of Multiple Regression Assumption

Multiple Linear Regression is a statistical regression method used to study the relationship between independent variables and dependent variables which is a study of linearity. If study the relationship between one independent variable and one dependent variable is called 'Linear Regression analysis. If there are more independent variables than one to analyze with one dependent variable, it is called Multiple Linear Regression (Chanaboon, 2017).

In assessing the linear regression assumption, it was found that the data did not violate the linear regression assumption. This is explained in (1) to (5) as follows:

1) The expected value of the standard error or E (εi) = 0 shows the result of testing in each hypothesis regarding the details in the table: Residual statistic. The Residual shows Mean = 0 in an appendix.

2) Frequency distributions of the standard error show a normality distribution (see table: Tests of Normality) in which all variables are displayed in an appendix.

3) Analyze the scatterplot of the standardized residual of dependent variables in each hypothesis to ensure that there is no heteroscedasticity problem. The result will be displayed in a normal P-P plot and histogram of all variables that are measured as the dependent variable.

4) Test the independent standard error with a Durbin-Watson coefficient value between 1 and 3 with a test indicating that an autocorrelation does not exist (Field, 2009). The result will be displayed under each hypothesis's result.

5) Variance Inflation Factors (VIF) are lower than 10, indicating no multicollinearity problems among variables. The result will be displayed under each hypothesis's result.

Therefore, the multiple regression method was used to test hypotheses. The list of analysis no. (1) – (3) will be displayed in an appendix and (4) – (5) will be displayed under each table of hypothesis testing in chapter 4.

3.4.5 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 influences 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 a certain group of people such as gender, age, and so on. For example, in certain situations, the way of teaching in school may affect students' grades positively if parents participate in their children's studies. Hence, the participation of the parents is a moderator which can change the rational relationship between teaching methods and students' results. In addition, this also can strengthen the relationship. Therefore, the coefficient may increase, and/or the direction can also change from positive (+) to negative (-) or turn conversely (Piriyakul, 2015, P.85-86).

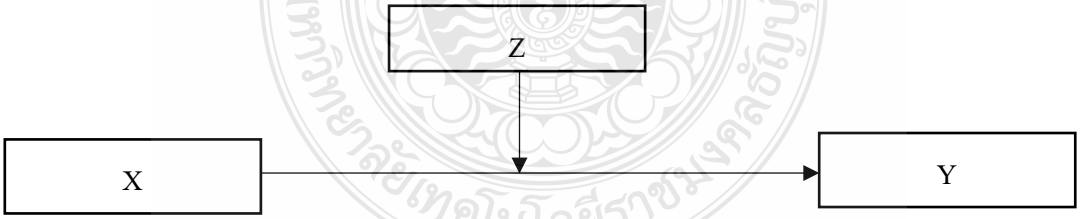


Figure 3.2 Model of moderation

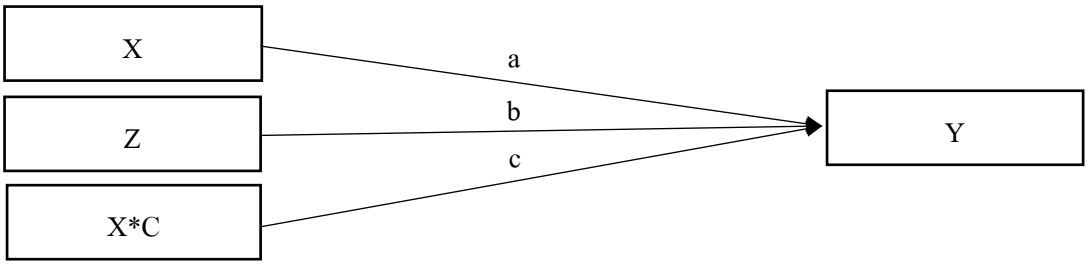


Figure 3.3 Moderator variable

The result confirms that the variable "Mode" is the moderator variable. The C line shows a significance (X and Z both affect Y) when there is an interaction of X and Z. This means X affects Y depending on the level of Z or the variation of Y depends on co-variation of X and Z which means X and Z are cofactors (Kanjanawasee and Soipetkasem, 2014).

This study's moderation is sustainability disclosure to test the relationship between intellectual capital and firm performance.

Table 3.4 Summary of definitions of dependent variables

Variable	Measurement	Description
(1) Return on assets (ROA_{t+1})	Net Income/Total Assets	Return on assets is a financial ratio which illustrates the percentage of profit that a firm gains from firms' overall resource. ROA evaluates the company's profit and is the ratio to present how efficient a company's management is at using its assets to generate earnings. The total assets are not included with non-using assets and assets under construction. If these are included with the calculation, it will make some errors to the report. This ratio shows whether the earnings from investment or using assets are efficient enough. The number should be high, which means high efficiency in using assets for earning profit.
(2) Sales ($Sales_{t+1}$)	Natural logarithm of net sales are THB	Sales performance is a key factor to increase a firm's revenue and profit growth. Therefore, it is essential to measure and develop sales performance in order to generate higher return on investment. This study aims to use net sales to reflect a firm's net income (Peter et al., 1998; Pätäri et al.,2014; Bayoud et al.,2012; Poowadin, 2016). Moreover, an increasing of certain products such as instant noodles or canned food can also reflect whether the economy is in a positive sign.

Table 3.4 Summary of definitions of dependent variables (Cont.)

Variable	Measurement	Description
(3) Return on Invested Capital ($ROIC_{t+1}$)	NOPAT / Invested Capital NOPAT = Net Operating Profit After Tax Invested Capital = Equity + Long-term Liabilities	If ROIC is higher than WACC, it means a firm gain return higher than cost of operation. An ROIC higher than the cost of capital means a company is healthy and growing, while an ROIC lower than cost of capital suggests an unsustainable business model. Conversely, it reflects that a firm seems to lack of strategic planning or ability when ROIC is lower than cost of operation. In addition, ROIC is used to measure and compare current performance with previous performance. When ROIC is increasing, a firm tends to be successful in cost management and profitability.
(4) Tobin's Q_{t+1}	(Market Capitalization + Total Debt)/ Total Assets Where Market Capitalization is the value of assets according to the market price (Setinvestnow, 2020).	Tobin's Q can be used to measure the marketing firm performance which investors perceive through their vision. If investors see the added value, the Tobin's Q rate will be more than 1 since the firm has higher marketing value than accounting value. (Thamprasart, 2014; Damodaran, 1999; Thamprasart & Phajongwong, 2018, Primasari, N. S., 2019; Bansal et al., 2021; Buallay, 2022; Carvajal & Nadeem, 2022).

Table 3.5 Summary of independent variable

Variable	Expect Sign	Measurement	Description
Intellectual Capital (IC) consist of three components as follows;	+	VAHC + VACA + STVA	
Capital employed efficiency (VACA)		Value added (VA)/ Capital employed (CE) VA = W + I + T + D + NI NI is the net income D is dividend W is wage and salary I is interest T is taxation CE is Capital employed which it has ability to estimate by physical asset financial asset or total assets – intangible asset.	Capital employed is designed to evaluate the efficiency of the use of tangible assets to increase the company's value (Pulic, 1988). This illustrates that intellectual capital is unable to help operate successfully without tangible assets. Therefore, IC is clearly vital to be considered and it can be gained from total assets deducted by intangible assets.

Table 3.5 Summary of independent variable (Cont.)

Variable	Expect Sign	Measurement	Description
Human capital efficiency (VAHC)		Value added (VA)/ Human capital (HC) HC is investment in human capital or salary, wage, welfare, other compensation in account current. These collect from "employee expense" which shows in notes to financial statement; expense characteristics.	Human Capital, any expenses spent on developing employee's abilities should be able to increase the companies' value.
Structural Capital efficiency (STVA)		Structural capital (SC)/ Value added (VA) SC is structural capital, measures by VA-HC	Structural capital evaluates the amount of expenses on structure capital by utilizing the resource after deducted human capital expenses from value added (because the information of human capital cannot be collected). If the company has high human capital, company's structure capital will be low.

Table 3.6 Summary of moderator variables sustainability disclosure

Variable	Expect Sign	Measurement	Description
(1)Sustainability Disclosure (SDINEX_I)	+	The unit of analysis used is 0 or 1 to imply, correspondingly, the nonappearance and occurrence of a performance indicator. Consequently, the maximum point of 145 could be given if a company disclosed on all universal standards which have 3 main indicators or 60 question indicators. Topic specific Standards have 33 main indicators or 85 question indicators.	The possible problems that occur from using the number of pages, paragraphs, sentences and words are eliminate by using the unit of analysis. Even though the unit of analysis used 0 or 1point method does not reveal the completeness or quality of the performance indicator disclosed. Consequently, the objective of pointing is recognizing the occurrence of each GRI Standards indicator.
(2)Sustainability Disclosure with explicit result (SDINDEX_II)	+	Universal Standards have 3 main indicators or 60 question indicators. The total points in each indicator is three. Topic specific Standards have 33 main indicators or 85 question indicators. The total is 145 indicators. The full points if disclose in accordance with the GRI Standards (Disclose all questions) is 3 points*145 indicators = 435 points as follows;	The process of implementing report including data collecting, rearranging, connecting data with strategies, measuring and performance evaluation can reflect a firm's development and realize the priority of which to manage first or later. Additionally, this can be data for making a decision and leads to creating innovation as well as to increase its value sustainably.

Table 3.6 Summary of moderator variables sustainability disclosure (Cont.)

Variable	Expect Sign	Measurement	Description
		(1) To give one point to those organizations which disclosed its sustainability. (2) To give another point to those organizations which follow the GRI Standards and illustrate in numbers as well as the tables, statistics, graphs, and pictures. (3) To give another point if that material topics is assured by the external assurance service providers in accordance with the GRI Standards (GRI 102: General Disclosure; Reporting Practice - Disclosure 102-56 External assurance).	

CHAPTER 4
RESEARCH RESULTS

This chapter presents the research results consisting of two sections. First, a brief overview of the descriptive statistics of the variables and correlation analysis as shown in topics 4.1-4.3. Second, the results of hypotheses testing as shown in topics 4.4 - 4.5. Finally, a summary of all hypotheses testing is given in topic 4.6.

4.1 Objectives of the Study

The main objectives of this study were to investigate the association among intellectual capital, sustainability disclosure and firm performance of listed firms on the Stock Exchange of Thailand.

The research's objectives are as follows:

Objective 1: To study relationship between intellectual capital and firm performance of listed firms on the Stock Exchange of Thailand

Objective 2: To study the moderating effect of sustainability disclosure on the relationship between intellectual capital and firm performance of listed firms on the Stock Exchange of Thailand.

4.2 Data Preparation

4.2.1 The Sampling Research

The sample of this research is listed firms operating in the agricultural and food industry, technology industry, and services industry. The total number of firms operating in these industries is 208. Of these, 4 firms with property funds were excluded from the sample of the listed firms as these firms had different financial statements compared to the other firms. A further 19 firms were excluded due to some missing financial statements during the 2018-2020 period. Consequently, 185 firms were employed in this analysis, the details of which are shown in Appendix 1. The variables in this research were intellectual capital and sustainability disclosure during the year, the 2018-2019 period. The dependent variable, firm performance, was estimated in the following year, the 2019-2020 period, for investigating the effect of independent variables in year t which is explained in chapter 3 topic 3.2.3.1.

4.2.2 Normal Distribution of Samples

Before the statistical analysis was performed, the normal distribution of this sample had been checked in terms of skewness and kurtosis value. Curran et al. (1996) stated that if the absolute skewness index was more than three, this meant the data spread was asymmetric or did not have a normal distribution. If the absolute kurtosis index was more than ten, it indicated that there was no normal distribution. From table 4.1, data collection shows the skewness is more than three so it does not have a normal distribution and cannot be measured by multiple regression. Thus, this research uses box-cox transformation.

Box and Cox (1964) developed the method of transformation known as "Box-Cox transformation" for solving a problem of normal distribution. Box-Cox transformation can help researchers solve a problem of abnormality and normal distribution (Box and Cox, 1964). Moreover, this can be used with positive and negative data (Weisberg, 2001; Marlaithong, 2019).

When considering each aspect of the descriptive statistics such as mean, maximum, minimum, standard deviation, skewness, and kurtosis after transforming by box-cox, the results show that the skewness (table 4.1) of variables is lower than 3.00. Therefore, it is a normal distribution while the kurtosis shows between -0.1738 and -0.1659, and the statistical result is not more than ten. Hence, it is concluded that the transformed data follows a normal distribution (Curran et al., 1996).

4.3 Descriptive Statistics and Correlation Matrixes of Variables

4.3.1 Descriptive Statistics

Descriptive statistics, including minimum, maximum, mean, standard deviation, skewness, and kurtosis, were generated for each variable and included in the model with the details shown in table 4.1.

This research made 370 observations. Of these, 98 observations were of the agricultural and food industry, 72 observations were of the technology industry, and 200 observations were of the services industry. The overall average of VAIC is 2.4284. When considering all aspects of intellectual capital, it is seen that the average of Value Added Human Capital (VAHC) has the highest value at 1.8946, followed by Value Added Structural Capital at 0.3268, and Value Added Capital Employed (VACE) at 0.2073, consecutively. Therefore, it is obvious that the

value added from intellectual capital is the result of firms listed on the Stock Exchange of Thailand investing their budget in developing their employees' skills. The rest is from structural capital (STVA), which firms use to strengthen good relationships with customers. Moreover, those firms have an effective administration and systems which can utilize their current employees' knowledge, skills, experiences, and abilities to the maximum even though some employees had already left the organization.

For firm performance, firms listed on the Stock Exchange of Thailand show the average ratio of ROA at 3.1865, sales at 19,403.7248 million baht, ROIC at 5.6016, and Tobin's Q at 1.6225, while the average ratios of sustainability disclosure (SDINDEX_I) and sustainability disclosure with explicit result (SDINDEX_II) are 63.3604 and 31.2739, respectively.

In table 4.2, the services industry has an average VAIC value of 2.5516 followed by the technology industry with an average of 2.4696. This reflects that both industries have invested in intellectual capital since it is necessary to change and update at all times. Moreover, the element of intellectual capital such as Value Added Human Capital (VAHC) remains the main part that has the highest average among three industries in which the services industry has an average VAHC value of 1.8483. This is consistent with the earlier explanation that the services industry has the highest average value of VAIC when compared to other industries. In each industry, there are specialists working and supporting those firms in a particular field. In the services industry, customer service staff work as representatives of their firms; hence, firms tend to train or develop those staff to be more professional and provide premium services to customers. This leads to sustainable profits. In the technology industry, especially in automation firms, it is necessary to hire skilled employees to assemble cars in the production line because those who have not been trained cannot be in charge of such positions. The moderator used in this study is sustainability disclosure; in the case of Type I, the agricultural and food industry has the highest average proportion at 66.2841% and in the case of Type II, the technology industry has the highest average proportion at 32.5864%. Firm performance measured by return on assets (ROA) and sales have the highest average values in the agricultural and food industry at 3.6201 and 22.5515, respectively. While return on investment capital and Tobin’s Q have the highest average value in the services industry at 7.6099 and 1.7040, respectively.

Table 4.1 Descriptive statistics of variables before and after box-cox transformation

Symbol	Scale	Min	Max	Mean	Std. Deviation	Skewness	Kurtosis
Overall, before transformation (n = 370 observations)							
VAIC	Value	-5.6900	17.3600	2.4284	2.0115	2.7174	18.1912
VACE	Value	-0.4700	0.9200	0.2073	0.1354	0.8432	4.6355
VAHC	Value	-6.3800	16.3400	1.8946	1.7500	3.6870	26.5671
STVA	Value	-4.8100	6.1100	0.3268	0.5899	-0.8507	50.9991
SDINDEX_I	Percentage	32.3900	98.6200	63.3604	11.1296	0.3318	0.6084
SDINDEX_II	Percentage	16.2000	72.6400	31.2739	8.9527	1.2202	1.7359
ROA	Ratio	-67.6200	56.3900	3.1865	10.2930	-1.1839	14.5422
Sales	Ln	3.0451	589,712.9220	19,403.7248	63,675.0002	6.7585	51.7889
ROIC	Ratio	-300.4000	298.8200	5.6016	30.6601	-2.9912	72.4007
Tobin's Q	Ratio	0.3800	10.9000	1.6225	1.2104	2.6165	11.2340
Ind_Agro	Dummy	0.0000	1.0000	0.2649	0.4419	1.0701	-0.8596
Ind_Tech	Dummy	0.0000	1.0000	0.1946	0.3964	1.5492	0.4021
Year2019	Dummy	0.0000	1.0000	0.5000	0.5007	0.0000	-2.0109
Leverage	Ratio	1.4300	144.5100	39.6892	22.1492	0.3904	0.1986
FirmSize	Ln	406.3732	761,719.0850	29,620.1243	86,768.2352	5.3403	32.2063
Overall, after transformation (n = 370 observations)							
VAIC	Value	-3.1673	8.0241	2.4284	1.9864	0.0001	-0.1661
VACE	Value	-0.1695	0.5841	0.2073	0.1335	0.0011	-0.1731
VAHC	Value	-2.9736	6.7628	1.8946	1.7281	0.0001	-0.1660
STVA	Value	-1.3143	1.9679	0.3268	0.5825	-0.0003	-0.1659
SDINDEX_I	Percentage	33.8943	94.3211	63.3616	10.9865	0.0026	-0.1738
SDINDEX_II	Percentage	6.3691	56.1787	31.2739	8.8403	-0.0001	-0.1670

Table 4.1 Descriptive statistics of variables before and after box-cox transformation (Cont.)

Symbol	Scale	Min	Max	Mean	Std. Deviation	Skewness	Kurtosis
ROA	Ratio	-25.4350	31.8150	3.1900	10.1618	0.0000	-0.1661
Sales	Ln	17.3917	26.8145	22.1031	1.6725	0.0000	-0.1662
ROIC	Ratio	-79.6908	90.8908	5.6000	30.2780	0.0000	-0.1662
Tobin's Q	Ratio	-1.7446	4.9896	1.6226	1.1950	0.0012	-0.1687
Ind_Agro	Dummy	0.0000	1.0000	0.2649	0.4419	1.0701	-0.8596
Ind_Tech	Dummy	0.0000	1.0000	0.1946	0.3964	1.5492	0.4021
Year2019	Dummy	0.0000	1.0000	0.5000	0.5007	0.0000	-2.0109
Leverage	Ratio	-21.9260	101.3044	39.6892	21.8733	0.0000	-0.1662
FirmSize	Ln	18.5456	26.7962	22.6709	1.4645	0.0000	-0.1662

Where: VAIC = Value Added Intellectual Coefficient, VACA = Value Added Capital Employed, VAHC = Value Added Human Capital, STVA = Value Added Structural Capital, SDINDEX_I = Sustainability Disclosure, SDINDEX_II = Sustainability Disclosure with explicit result, ROA = Return on Assets at year t+1, Sales = Natural logarithm net sales at year t+1, ROIC = Return on Investment Capital at year t+1, Tobin's Q = Tobin's Q at year t+1, Ind_Agro = agricultural and food industry, Ind_Tech = technology industry, Year2019 = year to collect dependent variable is year 2019, Leverage = leverage ratio at year t+1, and FirmSize = the size of firms at year t+1..

Table 4.2 Descriptive statistics of variables in each industry sample

Symbol	Scale	Min	Max	Mean	Std. Deviation
Agricultural and food industry (n = 98 observations)					
VAIC	Value	-5.6900	7.6500	2.1468	1.7786
VACE	Value	-0.4700	0.6200	0.1999	0.1436
VAHC	Value	-6.3800	6.6700	1.7107	1.4210
STVA	Value	-4.3800	1.1600	0.2357	0.6307
SDINDEX_I	Percentage	37.3200	93.1000	66.2841	12.4506
SDINDEX_II	Percentage	16.2000	54.9400	32.5441	9.6677
ROA	Ratio	-61.4700	20.8300	3.6201	10.3353
Sales	Ln	14.9290	27.1029	22.5515	1.6683
ROIC	Ratio	-300.4000	32.5000	1.3167	43.9601
Tobin's Q	Ratio	0.4600	7.1000	1.5581	1.3309
Year2019	Dummy	0.0000	1.0000	0.5000	0.5026
Leverage	Ratio	4.3500	90.2200	36.0662	22.0124
FirmSize	Ln	982.8376	761,719.0850	33,134.4308	108,304.5923
Technology Industry (n = 72 observations)					
VAIC	Value	-2.8400	12.3900	2.4696	2.2271
VACE	Value	-0.1600	0.4400	0.1633	0.1105
VAHC	Value	-3.9400	11.1900	1.8483	2.0469
STVA	Value	-0.9200	6.1100	0.4579	0.8030
SDINDEX_I	Percentage	38.1900	98.6200	63.4724	10.2561
SDINDEX_II	Percentage	19.9100	72.6400	32.5864	9.3522
ROA	Ratio	-46.8400	56.3900	3.1354	10.9086
Sales	Ln	18.4552	25.9212	22.4814	1.6548
ROIC	Ratio	-156.1100	31.2400	5.8554	22.0181
Tobin's Q	Ratio	0.4800	10.9000	1.4838	1.3749
Year2019	Dummy	0.0000	1.0000	0.5000	0.5035
Leverage	Ratio	8.9800	88.3400	48.1433	20.7861
FirmSize	Ln	928.6385	617,547.9000	41,629.4506	108,144.6107
Services Industry (n = 200 observations)					
VAIC	Value	-4.6000	17.3600	2.5516	2.0338
VACE	Value	0.0300	0.9200	0.2267	0.1361
VAHC	Value	0.1700	16.3400	2.0013	1.7806
STVA	Value	-4.8100	0.9400	0.3242	0.4594
SDINDEX_I	Percentage	32.3900	95.0700	61.8876	10.4977
SDINDEX_II	Percentage	16.9000	56.8100	30.1791	8.3207
ROA	Ratio	-67.6200	55.8900	2.9924	10.0895
Sales	Ln	17.1277	27.0348	21.7472	1.6453

Table 4.2 Descriptive statistics of variables in each industry sample (Cont.)

Symbol	Scale	Min	Max	Mean	Std. Deviation
ROIC	Ratio	-56.1300	298.8200	7.6099	24.8000
Tobin's Q	Ratio	0.3800	4.8900	1.7040	1.0785
Year2019	Dummy	0.0000	1.0000	0.5000	0.5010
Leverage	Ratio	1.4300	144.5100	38.4209	22.0318
FirmSize	Ln	406.3732	523,354.3297	23,574.7567	63,047.9728

Where: VAIC = Value Added Intellectual Coefficient, VACA = Value Added Capital Employed, VAHC = Value Added Human Capital, STVA = Value Added Structural Capital, SDINDEX_I = Sustainability Disclosure, SDINDEX_II = Sustainability Disclosure with explicit result, ROA = Return on Assets at year t+1, Sales = Natural logarithm net sales at year t+1, ROIC = Return on Investment Capital at year t+1, Tobin's Q = Tobin's Q at year t+1, Ind_Agro = agricultural and food industry, Ind_Tech = technology industry, Year2019 = year to collect dependent variable is year 2019, Leverage = leverage ratio at year t+1, and FirmSize = the size of firms at year t+1.

Remark: the FirmSize values in table 4.2 are the raw data before converted to their natural logarithmic values.

Collected sustainable disclosure data is based on the GRI Standards consisting of four topics: General disclosure and management approach, Economic disclosure, Environmental disclosure, and Social disclosure. Either the methods of Sustainability Disclosure (SDINDEX_I) or the Sustainability Disclosure with explicit result (SDINDEX_II) were used for each sector in the food and agriculture, technology, and services industries as shown in Table 4.3.

- General disclosure and management approach provide information for stakeholders, including shareholders, investors, or the general public, to give them a clear understanding of a company's sustainable policies, objectives, significant events, plans, targets, and long-term vision. The aim is to build confidence and a positive image of the organization as one that values sustainability and transparency for scrutiny. Additionally, it demonstrates the structure and management practices of the company. Both sustainability disclosure ratios, SDINDEX_I and SDINDEX_II have the highest proportion in the food and beverage sector within the agricultural and food industry.

- Economic disclosure refers to the operations and financial performance of a company in the dimension of sustainable economics, including its impact on local, national, and global economies and the stakeholders involved. The SDINDEX_I has the highest proportion of data collection in the commerce sector within the services industry.

On the other hand, the SDINDEX_II has the highest proportion in both the commerce and agribusiness sectors. Companies in these sectors emphasize reporting on topics related to economic performance to demonstrate the direct economic value generated and distributed to the public, financial impacts and risks due to climate change, financial risk management, or issues related to climate conditions, setting welfare and retirement plans, employee benefits, fair labor practices, employee count, employment practices, and government subsidies received.

- Environmental disclosure refers to the disclosure of policies and management practices related to environmental restoration, or the conservation of natural resources affected by business operations, waste management and material utilization from production processes. It also covers work practices related to biodiversity and relevant environmental regulations. Both the SDINDEX_I and SDINDEX_II have the highest proportion of data collection in the food and beverage sector within the agricultural and food industry. However, when considering the overall scores, it is still found that environmental disclosure is lower compared to other topics.

Most companies disclose information regarding environmental impacts resulting from their business operations, including impacts on air, water, and ecosystems, as well as management practices related to biodiversity and environmental management systems. Environmental operations require vigilance and compliance with laws and societal expectations. In some industries, where the management of stakeholders significantly matters, companies may engage external assurance to ensure the quality of reporting and enhance the credibility, completeness, accuracy, and relevance of the disclosed information. This helps build trust and demonstrates transparency to stakeholders affected by the company's operations.

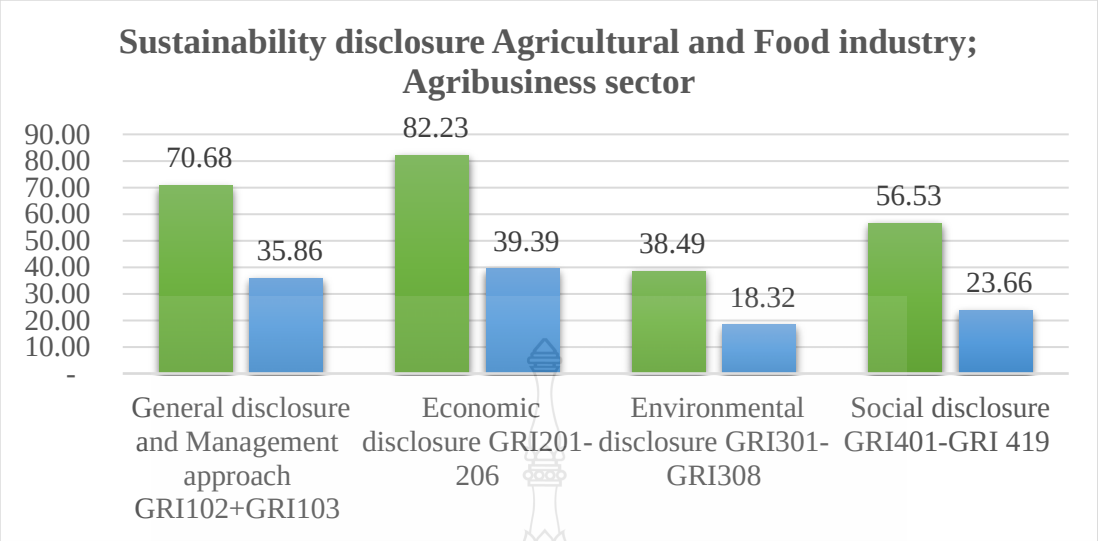
- Social disclosure involves the disclosure of policies and management practices related to workforce and employees, working conditions, development and training, community promotion and development surrounding the business, responsible practices regarding products and services, and the social dimension of sustainable performance. The SDINDEX_I has the highest proportion of data collection in the transportation and logistics sector within the services industry, while the SDINDEX_II

has the highest proportion in the electronic component sector within the technology industry.

When illustrating the proportions of data collected of both SDINDEX_I and SDINDEX_II, it can be observed that environmental disclosure has a lower proportion of disclosure compared to other topics. It emphasizes disclosure on topics that are expected to have issues or impacts on stakeholders or topics that should be disclosed to comply with legal principles. Environmental disclosure is mostly presented in narrative form rather than providing additional data in the form of tables or images. However, some companies recognize the significant impact of their business operations on society, communities, and the surrounding environment, and therefore, provide more external assurance to ensure the quality of disclosure.

Table 4.3 The summary of sustainability disclosure typing in each business sector industry

Industry	Sector	General disclosure and Management approach GRI102+GRI103		Economic disclosure GRI201-206		Environmental disclosure GRI301-GRI308		Social disclosure GRI401-GRI 419	
		DINDEX_I	SDINDEX_II	SDINDEX_I	SDINDEX_II	SDINDEX_I	SDINDEX_II	SDINDEX_I	SDINDEX_II
Agricultural and Food	Food and Beverage (Figure 4.1)	79.10	40.97	76.21	36.37	49.47	24.89	63.42	28.67
	Agribusiness (Figure 4.1)	70.68	35.86	82.23	39.39	38.49	18.32	56.53	23.66
Technology	Information technology and Communication (Figure 4.2)	77.40	40.65	67.75	33.48	25.24	12.80	68.44	34.24
	Electronic component (Figure 4.2)	75.17	39.25	76.92	38.08	36.41	19.27	72.25	36.25
Services	Transportation and Logistics (Figure 4.3)	78.06	40.74	80.30	38.89	34.17	18.26	73.42	34.93
	Media and Publishing (Figure 4.3)	74.10	37.88	63.23	30.92	25.81	12.94	64.70	30.62
	Professional services (Figure 4.3)	76.25	40.90	69.32	37.12	34.77	20.05	68.09	33.11
	Tourism & Leisure (Figure 4.3)	69.92	33.99	78.51	35.95	38.21	17.99	60.77	25.16
	Commerce (Figure 4.3)	75.23	39.10	82.85	39.39	32.95	16.93	64.16	30.03
	Health Care Services (Figure 4.3)	69.38	34.05	78.26	35.31	28.40	12.07	64.53	26.62



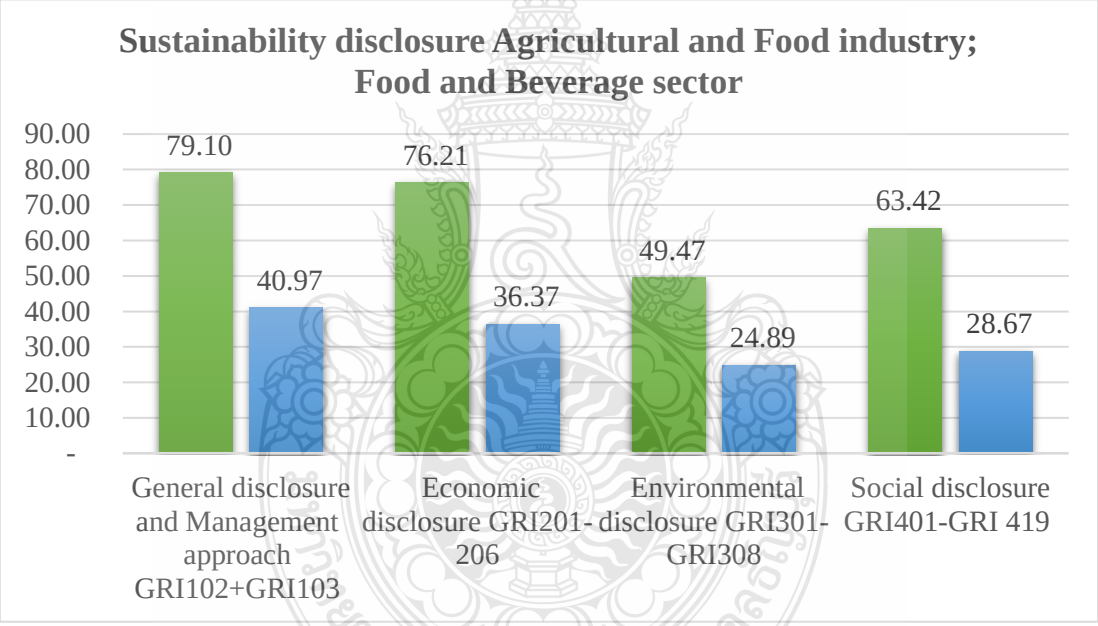


Figure 4.1 Sustainability disclosure in the agriculture and food industry

SDINDEX_I SDINDEX_II

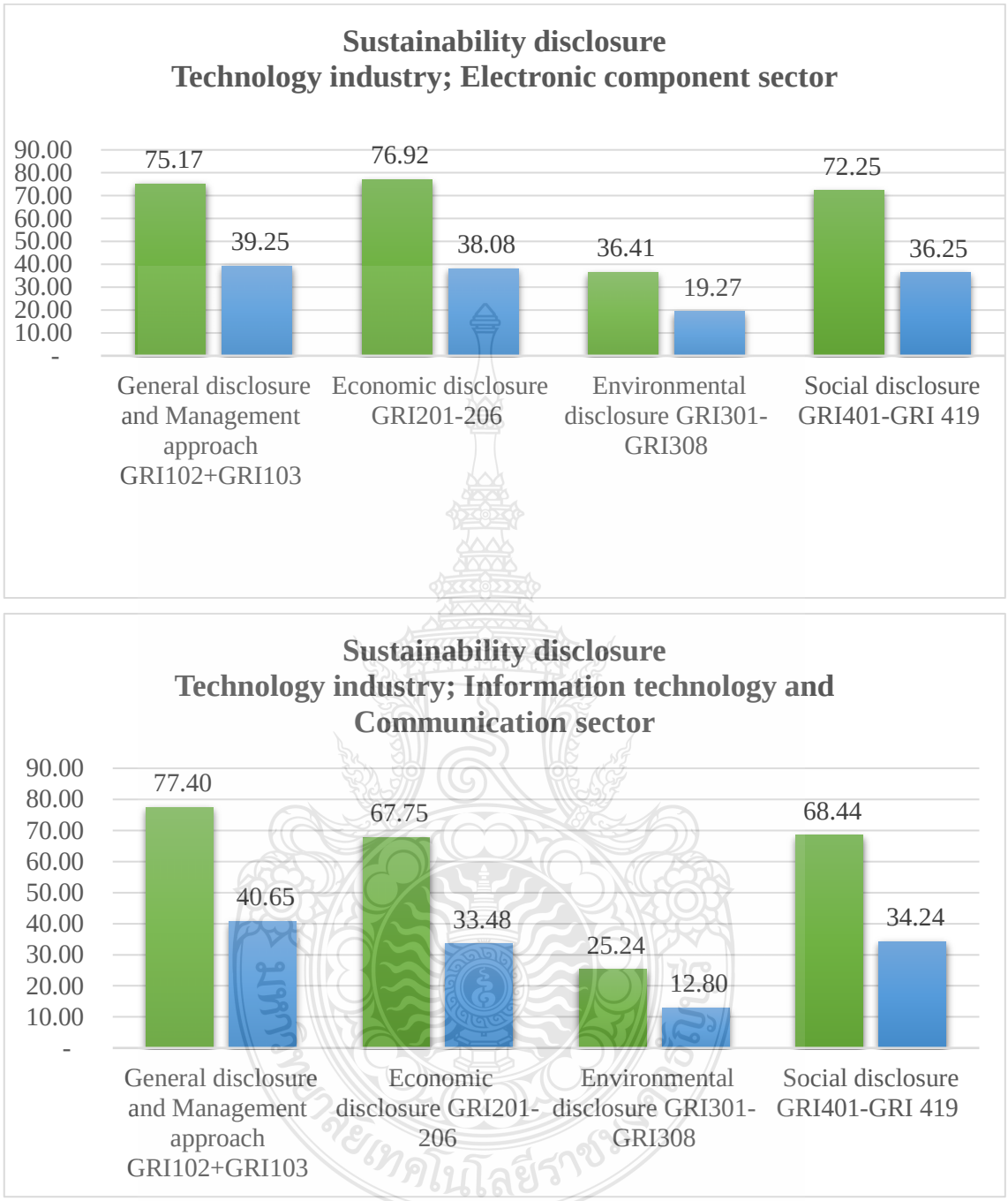


Figure 4.2 Sustainability disclosure in the technology industry

SDINDEX_I SDINDEX_II

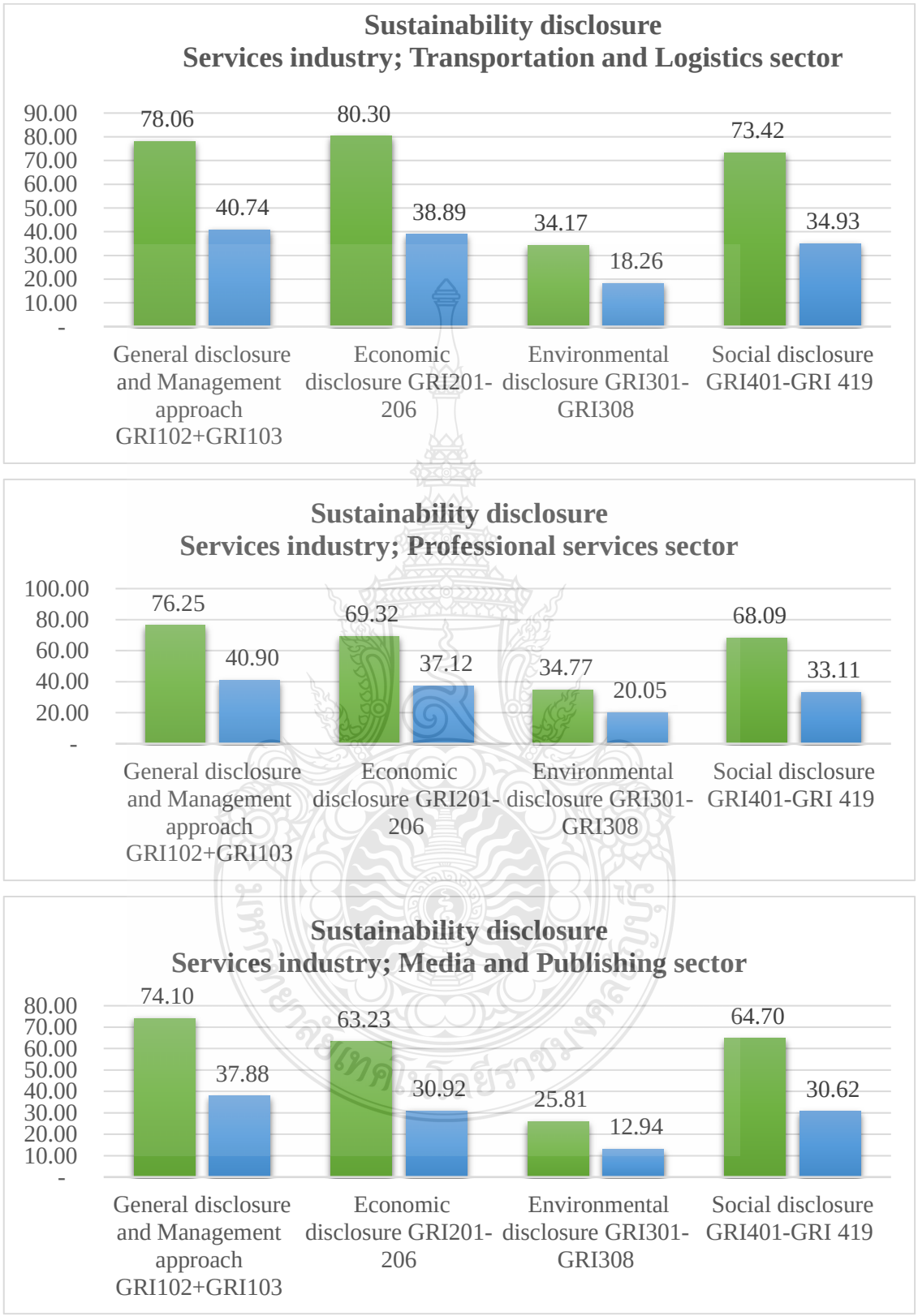
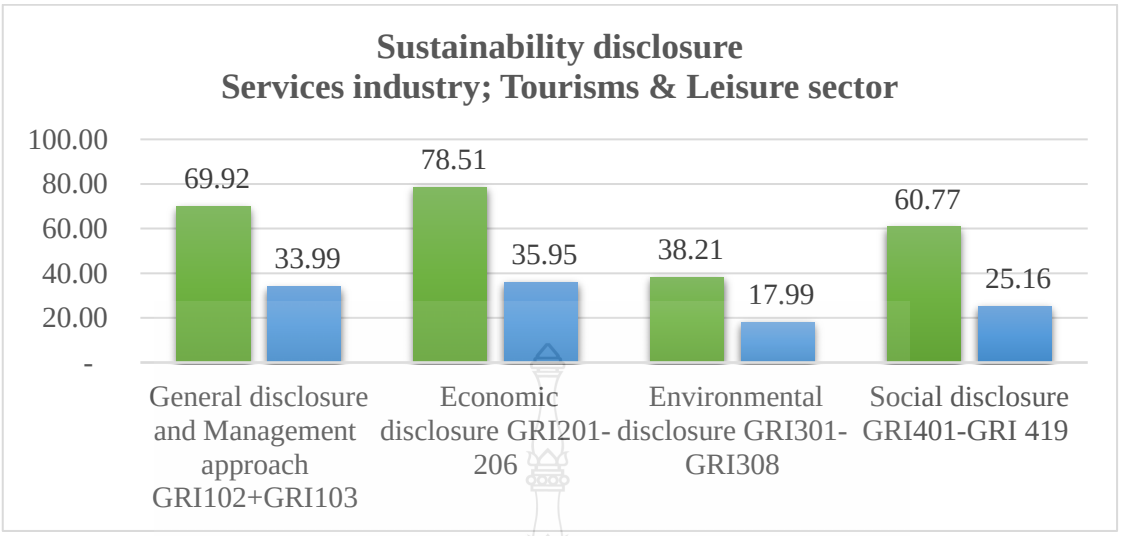
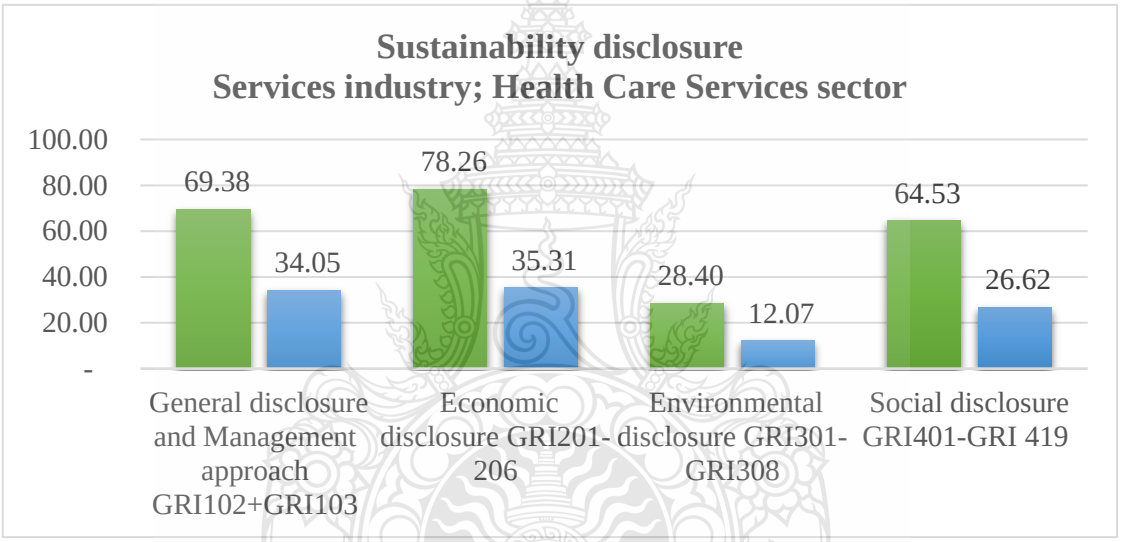


Figure 4.3 Sustainability disclosure in the services industry





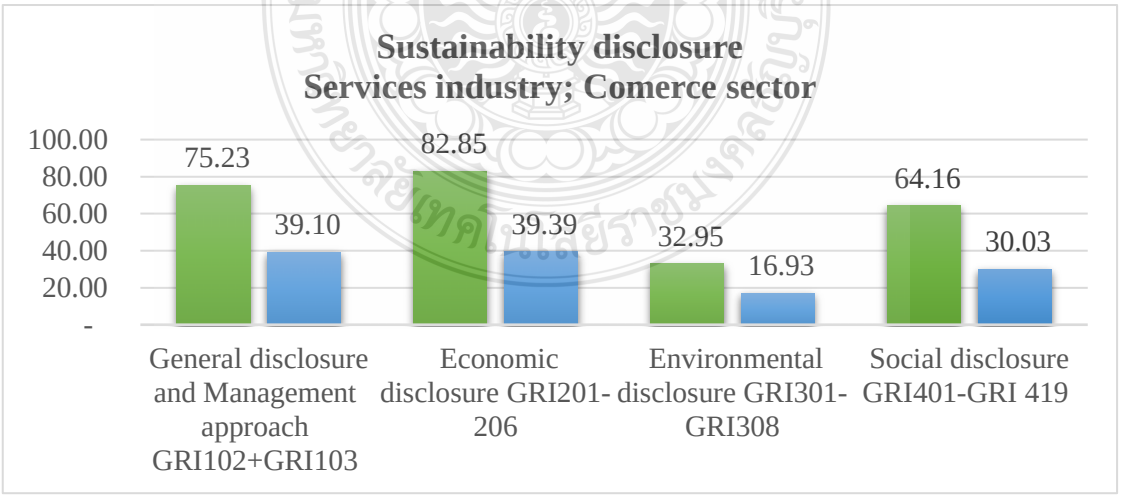


Figure 4.3 Sustainability disclosure in the services industry (Cont.)

SDINDEX_I SDINDEX_II

Table 4.4 Correlation matrix

	VAIC	ROA	Sales	ROIC	Tobin's Q	SDINDEX_I	SDINDEX_II	Leverage	Firm Size
VAIC	1.00								
ROA	.486**	1.00							
Sales	.164**	.257**	1.00						
ROIC	.222**	.391**	.133*	1.00					
Tobin's Q	.258**	.434**	.127*	.147**	1.00				
SDINDEX_I	0.02	0.01	.442**	-0.03	-0.03	1.00			
SDINDEX_II	0.05	0.03	.485**	0.02	-0.01	.950**	1.00		
Leverage	-.183**	-.317**	.371**	-0.10	-0.01	.140**	.196**	1.00	
FirmSize	.120*	-0.01	.523**	0.05	0.00	.295**	.328**	.254**	1.00

* significant level at 0.05

Where: VAIC = Value Added Intellectual Coefficient, SDINDEX_I = Sustainability Disclosure, SDINDEX_II = Sustainability Disclosure with explicit result, ROA = Return on Assets at year t+1, Sales = Natural logarithm net sales at year t+1, ROIC = Return on investment capital at year t+ 1, Tobin's Q = Tobin's Q at year t+1, Leverage = Leverage ratio at year t+1, FirmSize = the size of

4.3.2 Correlation Matrix

The Pearson correlations between the dependent and explanatory variables in table 4.4 indicate that value added intellectual coefficient has a positive correlation with firm performance. For sustainability disclosure, both SDINDEX_I and SDINDEX_II have a positive correlation with sales. A statistical significance level at 0.05 was denoted by *.

4.4 Result of Hypothesis 1 (Direct Effect)

Hypothesis 1: Intellectual capital has the positive relationship with firm performance of listed firms on the Stock Exchange of Thailand.

Hypothesis 1a: Intellectual capital has positive relationship with return on assets.

$$ROA_{it+1} = \beta_0 + \beta_1 VAIC_{it} + \beta_2 Ind\_Agro + \beta_3 Ind\_Tech + \beta_4 Year2019 + \beta_5 Leverage_{t+1} + \beta_6 FirmSize_{t+1}$$

Hypothesis 1b: Intellectual capital has positive relationship with sales.

$$Sales_{t+1} = \beta_0 + \beta_1 VAIC_{it} + \beta_2 Ind\_Agro + \beta_3 Ind\_Tech + \beta_4 Year2019 + \beta_5 Leverage_{t+1} + \beta_6 FirmSize_{t+1}$$

Hypothesis 1c: Intellectual capital has positive relationship with return on investment capital.

$$ROIC_{t+1} = \beta_0 + \beta_1 VAIC_{it} + \beta_2 Ind\_Agro + \beta_3 Ind\_Tech + \beta_4 Year2019 + \beta_5 Leverage_{t+1} + \beta_6 FirmSize_{t+1}$$

Hypothesis 1d: Intellectual capital has positive relationship with Tobin's Q

$$Tobin's\ Q_{t+1} = \beta_0 + \beta_1 VAIC_{it} + \beta_2 Ind\_Agro + \beta_3 Ind\_Tech + \beta_4 Year2019 + \beta_5 Leverage_{t+1} + \beta_6 FirmSize_{t+1}$$

The results of hypotheses 1a-1d are presented in table 4.5. From multiple regression, in terms of the relationship between intellectual capital and firm performance, at $p<0.05$, hypotheses 1a, 1c, and 1d are supported, which state a positive relationship exists between intellectual capital and firm performance when measured by ROA (VAIC at 0.0000, $p<0.05$), ROIC (VAIC at 0.0000, $p<0.05$), and Tobin's Q (VAIC at 0.0000, $p<0.05$).

The Durbin Watson statistic in each model is between 1 and 3, hence the model has no autocorrelation (Field, 2009). Moreover, the VIF value in each model is not over 10 and also has no multicollinearity problem. The model shows a goodness of fit test as indicated by the coefficient of determination adjusted R^2 of hypotheses 1a to 1d with values 0.2899, 0.7252, 0.2195, and 0.0684, respectively. This implies that independent variables can describe the variations of the result by adjusting R^2 at 30%, 73%, 22%, and 7%, respectively. The control variables Ind_Agro and Year 2019 have a positive relationship with sales, but Ind_Tech has only positive association with ROIC. The research finds statistical significance for Leverage and FirmSize. Leverage finds a negative relationship with ROA and a positive relationship with sales while FirmSize only finds a positive relationship with sales.

From the result, the statistically significant ($p<0.05$) positive relationship between intellectual and firm performance means the more budget a firm allocates to developing intellectual capital, the better financial performance will be. This is following the resource-based view theory (RBV) which proposes that creating a firm's value is not caused by external factors such as industries, but by internal factors instead and this leads to creating competitive advantage and firm performance (Barney, 1991). Competitive advantage is created when utilizing the resources in which intellectual capital is included, namely human capital, capital employed, and structural capital. Hence, firms should consider its importance and manage it properly (Yustyarani and Yuliana, 2020). Human capital is a key resource in each firm to generate competitive advantage, increase its value, and differentiate itself from other competitors which leads to a firm's goals (Kurniawan & Muharam, 2021; Costa et al., 2022; Sietas et al., 2022; Sucena et al. 2022). However, there is no significant relationship between VAIC and sales, but this can be explained that firms cannot administrate all elements of intellectual capital to work altogether effectively including human capital, structural capital, and capital employed to increase the level of capability to utilize all elements properly affecting the firm's sales volume. In other words, the period of collecting data may have affected the result tested. Moreover, there are some factors affecting the result as well e.g., expenses spent on employees and the pandemic COVID-19 (Setiany, 2021; Phromsuwansiri et al. 2022).

Table 4.5 Multiple regression of intellectual capital and firm performance

Variables	ROA (H1a)			Sales (H1b)			ROIC (H1c)			Tobin's Q (H1d)		
	β	**Sig.**	**VIF**	***β***	**Sig.**	**VIF**	***β***	**Sig.**	**VIF**	***β***	**Sig.**	**VIF**
(Constant)	-11.1686	0.1330		1.2946	0.0912		-46.1046	0.0481*		2.5628	0.0119*	
VAIC	2.1035	0.0000*	1.1893	0.0145	0.5646	1.1885	6.4819	0.0000*	1.1811	0.1771	0.0000*	1.1917
Ind_Agro	1.8323	0.0887	1.1365	0.6492	0.0000*	1.1376	5.7011	0.0900	1.1372	-0.1004	0.4924	1.1369
Ind_Tech	1.1057	0.3578	1.1417	0.2653	0.0318*	1.1422	8.6325	0.0215*	1.1456	-0.2637	0.1076	1.1411
Year2019	1.0819	0.2263	1.0086	0.2490	0.0070*	1.0082	3.8920	0.1632	1.0071	-0.0983	0.4190	1.0083
Leverage	-0.1241	0.0000*	1.3270	0.0077	0.0015*	1.3272	-0.1133	0.1269	1.3342	0.0045	0.1604	1.3360
FirmSize	0.5726	0.1038	1.3282	0.8876	0.0000*	1.3275	1.5390	0.1629	1.3353	-0.0628	0.1917	1.3331
Model summary												
F-Stat	25.8407			162.0189			18.1049			5.4639		
(F-Stat Sig.)	0.0000*			0.0000*			0.0000*			0.0000*		
Durbin-Watson	2.0851			2.0215			2.1335			1.7808		
R^2	0.3016			0.7298			0.2323			0.0837		
Adjusted R^2	0.2899			0.7252			0.2195			0.0684		

* Significance levels of 0.05.

Where: VAIC = Value Added Intellectual Coefficient, ROA = Return on Assets at year t+1, Sales = Natural logarithm net sales at year t+1, ROIC = Return on investment capital at year t+1, Tobin's Q = Tobin's Q at year t+1, Ind_Agro = agricultural and food industry, Ind_Tech = technology industry, Year2019 = year to collect dependent variable is year 2019, Leverage = leverage ratio at year t+1, and FirmSize = the size of firms at year t+1.

Table 4.6 Multiple regression of the elements of intellectual capital and firm performance

Variables	ROA			Sales			ROIC			Tobin's Q		
	β	**Sig.**	**VIF**	***β***	**Sig.**	**VIF**	***β***	**Sig.**	**VIF**	***β***	**Sig.**	**VIF**
(Constant)	-28.1596	0.0001*		-0.9713	0.1614		-92.8509	0.0001*		-0.0409	0.9663	
VACA	30.7657	0.0000*	1.1424	3.4739	0.0000*	1.1421	87.4475	0.0000*	1.1421	4.2581	0.0000*	1.1450
VAHC	0.9458	0.0536	4.2497	-0.0305	0.5202	4.2443	4.6771	0.0027*	4.2168	-0.0393	0.5515	4.2462
STVA	2.7672	0.0452*	3.8360	-0.0953	0.4772	3.8400	3.4817	0.4266	3.8169	0.4849	0.0096	3.8387
Ind_Agro	2.2423	0.0225*	1.1392	0.6995	0.0000*	1.1403	6.9618	0.0257*	1.1398	-0.0531	0.6885	1.1394
Ind_Tech	2.4989	0.0255*	1.1730	0.4638	0.0000*	1.1758	13.4098	0.0002*	1.1784	-0.0887	0.5569	1.1764
Year2019	1.2718	0.1191	1.0085	0.2648	0.0009*	1.0080	4.3998	0.0893	1.0069	-0.0848	0.4412	1.0080
Leverage	-0.1230	0.0000*	1.3371	0.0085	0.0001*	1.3373	-0.1011	0.1427	1.3455	0.0041	0.1574	1.3455
FirmSize	1.1216	0.0008*	1.4100	0.9572	0.0000*	1.4076	2.9615	0.0051	1.4149	0.0264	0.5560	1.4163
Model summary												
F-Stat	32.1864			180.6998			23.3171			15.1879		
(F-Stat Sig.)	0.0000*			0.0000*			0.0000*			0.0000*		
Durbin-Watson	2.1690			2.0126			2.1826			1.8694		
R^2	0.4204			0.8024			0.3445			0.2550		
Adjusted R^2	0.4073			0.7980			0.3297			0.2382		

* Significance levels of 0.05.

Where: VACA = Value Added Capital Employed, VAHC = Value Added Human Capital, STVA = Value Added Structural Capital, ROA = Return on Assets at year t+1, Sales = Natural logarithm net sales at year t+1, ROIC = Return on Investment Capital at year t+1, Tobin's Q = Tobin's Q at year t+1, Ind_Agro = agricultural and food industry, Ind_Tech = technology industry, Year2019 = year to collect dependent variable is year 2019, Leverage = leverage ratio at year t+1, and FirmSize = the size of firms at year t+1.

Moreover, the relationship between elements of intellectual capital (VACA, VAHC, and STVA) and firm performance was tested with results shown in table 4.6. These results show that VACA has a positive relationship with all indicators used to measure firm performance. It can be said that investigating VACA, including tangible assets and other financial assets, tends to enhance firm performance. Physical capital has the most influence on firm performance when compared to other aspects of intellectual capital. It can be concluded that tangible assets are the most essential factor to drive and increase firm performance to better results (Zehri et al., 2012; Fahimi and Fakhari,2017). VAHC finds a positive significance with ROIC; this finding shows investing in human capital can increase the efficiency of firm performance. However, investing in human capital needs some time to train and develop skills (Jaroenthip, 2018; Thamprasart, 2018). STVA finds a directly positive significance with ROA. If firms attach importance to intellectual capital such as structural capital, especially in customer relationship building and internal organization's system, the firms will be able to retain the knowledge, skills, experiences, and abilities imparted by their employees even after the resignation of those employees.

4.5 Result of Hypothesis 2 (Moderation Effect)

The moderation effect between the independent variable and the dependent variable was tested; the moderator in this study was the type of sustainability disclosure checklist conforming to GRI standards guidelines.

Hypothesis 2: Sustainability disclosure moderates the relationship between intellectual capital and firm performance such that the effect of intellectual capital and firm performance is stronger when firms possess high sustainability disclosure than when firms possess low sustainability disclosure of listed firms on the Stock Exchange of Thailand.

Hypothesis 2a: Sustainability disclosures (SDINDEX_I) moderates the relationship between intellectual capital and return on assets.

$$\mathrm{ROA}_{t+1} = \beta_0 + \beta_1 \mathrm{VAIC}_{it} + \beta_2 \mathrm{SDINDEX\_I}_{it} + \beta_3 \mathrm{VAIC.\ SDINDEX\_I}_{it} + \beta_4 \mathrm{Ind\_Agro} + \beta_5 \mathrm{Ind\_Tech} + \beta_6 \mathrm{Year2019} + \beta_7 \mathrm{Leverage}_{t+1} + \beta_8 \mathrm{FirmSize}_{t+1}$$

Hypothesis 2b: Sustainability disclosures (SDINDEX_I) moderates the relationship between intellectual capital and sales.

$$\text{Sales}_{t+1} = \beta_0 + \beta_1 \text{VAIC}_{it} + \beta_2 \text{SDINDEX\_I}_{it} + \beta_3 \text{VAIC. SDINDEX\_I}_{it} + \beta_4 \text{Ind\_Agro} + \beta_5 \text{Ind\_Tech} + \beta_6 \text{Year2019} + \beta_7 \text{Leverage}_{t+1} + \beta_8 \text{FirmSize}_{t+1}$$

Hypothesis 2c: Sustainability disclosures (SDINDEX_I) moderates the relationship between intellectual capital and return on investment capital.

$$\text{ROIC}_{t+1} = \beta_0 + \beta_1 \text{VAIC}_{it} + \beta_2 \text{SDINDEX\_I}_{it} + \beta_3 \text{VAIC. SDINDEX\_I}_{it} + \beta_4 \text{Ind\_Agro} + \beta_5 \text{Ind\_Tech} + \beta_6 \text{Year2019} + \beta_7 \text{Leverage}_{t+1} + \beta_8 \text{FirmSize}_{t+1}$$

Hypothesis 2d: Sustainability disclosures (SDINDEX_I) moderates the relationship between intellectual capital and Tobin's Q.

$$\text{Tobin's Q}_{t+1} = \beta_0 + \beta_1 \text{VAIC}_{it} + \beta_2 \text{SDINDEX\_I}_{it} + \beta_3 \text{VAIC. SDINDEX\_I}_{it} + \beta_4 \text{Ind\_Agro} + \beta_5 \text{Ind\_Tech} + \beta_6 \text{Year2019} + \beta_7 \text{Leverage}_{t+1} + \beta_8 \text{FirmSize}_{t+1}$$

The results of hypotheses 2a-2d are presented in table 4.7. From multiple regression analysis, in terms of sustainability disclosure moderating the relationship between intellectual capital and firm performance at $p<0.05$, only hypothesis 2d was supported (VAIC at 0.0000 and VAIC. SDINDEX_I at 0.0115, $p < 0.05$), which states that sustainability disclosure moderates the relationship between intellectual capital and Tobin's Q, such that the effect of intellectual capital and firm performance which measured by Tobin's Q is stronger when firms possess high sustainability disclosure than when firms possess low sustainability disclosure of listed firms on the Stock Exchange of Thailand.

The Durbin Watson statistic in each model was between 1 and 3, hence the model had no autocorrelation (Field, 2009). Moreover, the VIF value in each model is not over 10 and also has no multicollinearity problem. The model showed a goodness of fit test as indicated by the coefficient of determination adjusted R^2 of hypotheses 2a to 2d with values 0.2884, 0.7237, 0.2161, and 0.0798, respectively. This implies that independent variables could describe the variations of the result by adjusting R^2 at 29%, 72%, 22%, and 8%. respectively. The all-control variables found a positive relationship with sales, but only FirmSize is negatively associated with ROA, and Ind_Tech is positively associated with ROIC.

For testing the moderation effect when applying the Sustainability Disclosure Type II, the following hypotheses are put forward.

Hypothesis 2e: Sustainability disclosures with explicit result (SDINDEX_II) moderates the relationship between intellectual capital and return on assets.

$$ROA_{t+1} = \beta_0 + \beta_1 VAIC_{it} + \beta_2 SDINDEX\_II_{it} + \beta_3 VAIC.\ SDINDEX\_II_{it} + \beta_4 Ind\_Agro + \beta_5 Ind\_Tech + \beta_6 Year2019 + \beta_7 Leverage_{t+1} + \beta_8 FirmSize_{t+1}$$

Hypothesis 2f: Sustainability disclosures with explicit result (SDINDEX_II) moderates the relationship between intellectual capital and sales.

$$Sales_{t+1} = \beta_0 + \beta_1 VAIC_{it} + \beta_2 SDINDEX\_II_{it} + \beta_3 VAIC.\ SDINDEX\_II_{it} + \beta_4 Ind\_Agro + \beta_5 Ind\_Tech + \beta_6 Year2019 + \beta_7 Leverage_{t+1} + \beta_8 FirmSize_{t+1}$$

Hypothesis 2g: Sustainability disclosures with explicit result (SDINDEX_II) moderates the relationship between intellectual capital and return on investment capital.

$$ROIC_{t+1} = \beta_0 + \beta_1 VAIC_{it} + \beta_2 SDINDEX\_II_{it} + \beta_3 VAIC.\ SDINDEX\_II_{it} + \beta_4 Ind\_Agro + \beta_5 Ind\_Tech + \beta_6 Year2019 + \beta_7 Leverage_{t+1} + \beta_8 FirmSize_{t+1}$$

Hypothesis 2h: Sustainability disclosures with explicit result (SDINDEX_II) moderates the relationship between intellectual capital and Tobin's Q.

$$Tobin's\ Q_{t+1} = \beta_0 + \beta_1 VAIC_{it} + \beta_2 SDINDEX\_II_{it} + \beta_3 VAIC.\ SDINDEX\_II_{it} + \beta_4 Ind\_Agro + \beta_5 Ind\_Tech + \beta_6 Year2019 + \beta_7 Leverage_{t+1} + \beta_8 FirmSize_{t+1}$$

The results of testing hypotheses 2e-2h are presented in table 4.8. From multiple regression, in terms of sustainability disclosure with explicit result moderating the relationship between intellectual capital and firm performance at $p<0.05$, only hypothesis 2h was supported (VAIC at 0.0000 and VAIC.SDINDEX_II at 0.0122, $p < 0.05$), which states that sustainability disclosure with explicit result moderates the relationship between intellectual capital and Tobin's Q, such that the effect of intellectual capital and firm performance which measured by Tobin's Q is stronger when firms possess high sustainability disclosure than when firms possess low sustainability disclosure of listed firms on the Stock Exchange of Thailand.

The Durbin Watson statistic in each model was between 1 and 3, hence the model had no autocorrelation (Field, 2009). Moreover, the VIF value in each model is not over 10 and also has no multicollinearity problem. The model showed a goodness of fit test as indicated by the coefficient of determination adjusted $R^2$of hypotheses 2a to 2d with values 0.2890, 0.7272, 0.2173, and 0.0796, respectively. This implies that independent variables could describe the variations of the result by adjusting R^2 at 29%, 73%, 22%, and 8%, respectively. The all-control variables found a positive relationship with sales, but only FirmSize is negatively associated with ROA, and Ind_Tech is positively associated with ROIC

From testing the moderation effect, it is found that there is only one indicator of firm performance; Tobin's Q has a positive significance. Regarding the result of the moderation testing and sustainability disclosure, sustainability disclosure has positive significance with the relationship between intellectual capital and firm performance measured by Tobin's Q. This reflects that the more firms give importance to sustainability disclosure, the better firm performance will be when intellectual capital stimulates firm performance measured by Tobin's Q. Besides, illustrating more pictures or tables (apart from describing only details) and presenting topics related to stakeholders' concerns can enhance a better understanding and image to the public; for example, external assurance which evaluates and assures the quality of a firm's administration on environmental issues to allow stakeholders or readers consider impartial information about its processes.

As mentioned earlier, investors and analysts seem to be able to assess the risk and forecast future firm performance as well as the survival of society and communities which leads to a relationship between communities and society (Kiattikulwattana & Pattanapanyasat, 2019). The result is found to be in accordance with stakeholder theory as firms are expected to describe the information to stakeholders. Therefore, information about intellectual capital, which is considered an intangible asset, can assist investors in making their decision rather than reading only financial statements (Setiany, 2021). Additionally, this strengthens the firm's success and generates legitimacy based on regulations or laws in treating stakeholders (Klaewtanong, 2018; Kurniawan & Muharam, 2021, Bansal et al., 2021; Carvajal and Nadeem, 2022). Reporting topics related to intellectual capital in the sustainability report boost a firm's value measured by Tobin's Q

since transparent and accurate information is added for investors which later affects the firm's profitability (Primasari, 2019; Bansal et al. 2021; Setiany, 2021).

When considering variable sustainability disclosure, it is found that data collected based on the sustainability disclosure (SDINDEX_I) method does not have a significant effect on firm performance. However, there is a positive significance with the Type II method in which the firms disclose its sustainability with pictures, tables, or external assurance; hence, firm performance increases as measured by sales volume (SDINDEX_II at 0.0220, p., <0.05). Thus, it can be concluded that the firm's profitability becomes high when the firm discloses its sustainability. Sustainability development also brings more methods and tools to generate competitive advantage (Maletic et al., 2015; Poowadin et al., 2018. Reporting also fulfills stakeholders' needs which enhances firm performance (Bansal et al. 2021; Setiany, 2021), strengthens the relationship between the firm and stakeholders, promotes the firm's fame, and reduces cost and the asymmetry of data reported following legitimacy theory and stakeholder theory (Buallay, 2022).

To confirm the moderation effect of sustainability disclosure, the results are directly tested and compared as well as the case that there is an added moderator variable in the analysis model presented in table 4.9that shows the coefficient of VAIC is 0.1771 and the value R^2 is 0.0837 or 8.37%. The result of direct testing (H1d) shows less value than the coefficient of VAIC and R^2 regarding the hypothesis H2d (0.3597, 0.1000 or 10%) and the hypothesis H2h (0.3603, 0.0998 or 9.98%). This illustrates that sustainability disclosure has a moderating effect and can change the main influence of VAIC that affects Tobin’s Q (H1d). This affects the coefficient and R^2 (direct testing) becomes less than the moderator testing in the hypothesis H2d, H2h (Piriyakul, 2015, p.86-87).

Table 4.7 Test Sustainability disclosure as a moderator variable between intellectual capital and firm performance

Variables	ROA (H2a)			Sales (H2b)			ROIC (H2c)			Tobin's Q (H2d)		
	β	**Sig.**	**VIF**	***β***	**Sig.**	**VIF**	***β***	**Sig.**	**VIF**	***β***	**Sig.**	**VIF**
(Constant)	-5.1678	0.5524		1.8704	0.0376*		-29.2419	0.2829		2.9194	0.0135*	
VAIC	4.2366	0.0000*	1.2083	0.0383	0.4485	1.2084	12.9984	0.0000*	1.2009	0.3597	0.0000*	1.2084
SDINDEX_I	-0.0465	0.9286	1.3393	0.0562	0.2932	1.3393	-0.2798	0.8633	1.3398	-0.0228	0.7449	1.3393
VAIC.SDINDX_I	0.3251	0.4656	1.0278	0.0115	0.8016	1.0278	0.6069	0.6653	1.0264	0.1529	0.0115*	1.0278
Ind_Agro	1.8516	0.0862	1.1412	0.6592	0.0000*	1.1423	5.7306	0.0897	1.1424	-0.1066	0.4646	1.1423
Ind_Tech	0.8876	0.4634	1.1444	0.2585	0.0380*	1.1456	8.0401	0.0337*	1.1503	-0.2752	0.0918	1.1456
Year2019	1.2003	0.1819	1.0167	0.2612	0.0050*	1.0156	4.1424	0.1404	1.0140	-0.0787	0.5168	1.0156
Leverage	0.5267	0.1893	1.7182	0.8627	0.0000*	1.7180	1.4722	0.2410	1.7174	-0.0592	0.2753	1.7180
FirmSize	-0.1222	0.0000*	1.3459	0.0081	0.0010*	1.3461	-0.1068	0.1527	1.3486	0.0040	0.2139	1.3461
Model summary												
F-Stat	19.4442			120.5145			13.5441			4.9576		
(F-Stat Sig.)	0.0000*			0.0000*			0.0000*			0.0000*		
Durbin-Watson	2.0820			2.0215			2.1308			1.7786		
R^2	0.3041			0.7298			0.2333			0.1000		
Adjusted R^2	0.2884			0.7237			0.2161			0.0798		

* Significance levels of 0.05.

Where: VAIC = Value Added Intellectual Coefficient, SDINDEX_I = Sustainability Disclosure, VAIC.SDINDX_I = The interaction between Value Added Intellectual Coefficient and Sustainability Disclosure, ROA = Return on Assets at year t+1, Sales = Natural logarithm net sales at year t+1, ROIC = Return on investment capital at year t+1, Tobin's Q = Tobin's Q at year t+1, Ind_Agro = agricultural and food industry, Ind_Tech = technology industry, Year2019 = year to collect dependent variable is year 2019, Leverage = leverage ratio at year t+1, and FirmSize = the size of firms at year t+1.

Table 4.8 Test of sustainability disclosure with explicit result as a moderator variable between intellectual capital and firm performance

Variables	ROA (H2e)			Sales (H2f)			ROIC (H2g)			Tobin's Q (H2h)		
	β	**Sig.**	**VIF**	***β***	**Sig.**	**VIF**	***β***	**Sig.**	**VIF**	***β***	**Sig.**	**VIF**
(Constant)	-1.1746	0.8934		2.4478	0.0067*		-16.0616	0.5580		3.0953	0.0094	
VAIC	4.2551	0.0000*	1.2008	0.0418	0.4039	1.2008	13.0783	0.0000*	1.1934	0.3603	0.0000*	1.2008
SDINDEX_II	0.4596	0.3838	1.3819	0.1240	0.0220*	1.3811	1.4246	0.3881	1.3820	-0.0012	0.9863	1.3811
VAIC.SDINDX_II	0.0863	0.8450	1.0374	0.0231	0.6099	1.0372	-0.1901	0.8909	1.0346	0.1502	0.0122*	1.0372
Ind_Agro	1.9245	0.0745	1.1411	0.6679	0.0000*	1.1423	5.9931	0.0758	1.1423	-0.1046	0.4733	1.1423
Ind_Tech	0.9673	0.4246	1.1467	0.2684	0.0304*	1.1480	8.3802	0.0270*	1.1529	-0.2781	0.0888	1.1480
Year2019	1.2197	0.1749	1.0170	0.2702	0.0035*	1.0156	4.2190	0.1330	1.0143	-0.0788	0.5159	1.0156
Leverage	0.3471	0.3894	1.7395	0.8371	0.0000*	1.7388	0.8791	0.4859	1.7382	-0.0666	0.2223	1.7388
FirmSize	-0.1211	0.0000*	1.3496	0.0079	0.0011*	1.3498	-0.1037	0.1653	1.3523	0.0037	0.2458	1.3498
Model summary												
F-Stat	19.4968			122.6094			13.6330			4.9446		
(F-Stat Sig.)	0.0000*			0.0000*			0.0000*			0.0000*		
Durbin-Watson	2.0831			2.0277			2.1377			1.7797		
R^2	0.3047			0.7332			0.2345			0.0998		
Adjusted R^2	0.2890			0.7272			0.2173			0.0796		

* Significance levels of 0.05.

Where: VAIC = Value Added Intellectual Coefficient, SDINDEX_II = Sustainability Disclosure with explicit result, VAIC.SDINDX_II = The interaction between Value Added Intellectual Coefficient and Sustainability Disclosure with explicit result, ROA = Return on Assets at year t+1, Sales = Natural logarithm net sales at year t+1, ROIC = Return on investment capital at year t+1, Tobin's Q = Tobin's Q at year t+1, Ind_Agro = agricultural and food industry, Ind_Tech = technology industry, Year2019 = year to collect dependent variable is year 2019, Leverage = leverage ratio at year t+1, and FirmSize = the size of firms at year t+1.

Table 4.9 The comparison of the direct effect between intellectual capital and Tobin's Q with the moderation effect analysis of Sustainability Disclosure and Sustainability Disclosure with explicit result

Variables	Direct effect			Moderation effect					
	Tobin's Q (H1d)			Tobin's Q (H2d)			Tobin's Q (H2h)		
	β	Sig.	VIF	*β*	Sig.	VIF	*β*	Sig.	VIF
(Constant)	2.5628	0.0119*		2.9194	0.0135*		3.0953	0.0094	
VAIC	0.1771	0.0000*	1.1917	0.3597	0.0000*	1.2084	0.3603	0.0000*	1.2008
SDINDEX_I				-0.0228	0.7449	1.3393			
VAIC.SDINDX_I				0.1529	0.0115*	1.0278			
SDINDEX_II							-0.0012	0.9863	1.3811
VAIC.SDINDE_II							0.1502	0.0122*	1.0372
Ind_Agro	-0.1004	0.4924	1.1369	-0.1066	0.4646	1.1423	-0.1046	0.4733	1.1423
Ind_Tech	-0.2637	0.1076	1.1411	-0.2752	0.0918	1.1456	-0.2781	0.0888	1.1480
Year2019	-0.0983	0.4190	1.0083	-0.0787	0.5168	1.0156	-0.0788	0.5159	1.0156
Leverage	0.0045	0.1604	1.3360	-0.0592	0.2753	1.7180	-0.0666	0.2223	1.7388
FirmSize	-0.0628	0.1917	1.3331	0.0040	0.2139	1.3461	0.0037	0.2458	1.3498
Model summary									
F-Stat	5.4639			4.9576			4.9446		
(F-Stat Sig.)	0.0000*			0.0000*			0.0000*		
Durbin-Watson	1.7808			1.7786			1.7797		
R^2	0.0837			0.1000			0.0998		
Adjusted R^2	0.0684			0.0798			0.0796		

* Significance levels of 0.05.

Where: VAIC = Value Added Intellectual Coefficient, SDINDEX_I = Sustainability Disclosure, SDINDEX_II = Sustainability Disclosure with explicit result, VAIC.SDINDX_I = The interaction between Value Added Intellectual Coefficient and Sustainability Disclosure, VAIC.SDINDX_II = The interaction between Value Added Intellectual Coefficient and Sustainability Disclosure with explicit result, Tobin's Q = Tobin's Q at year t+1, Ind_Agro = agriculture and food industry, Ind_Tech = technology industry, Year2019 = year to collect dependent variable is year 2019, Leverage = leverage ratio at year t+1, and FirmSize = the size of firms at year t+1.

The values of R Squared from hypothesis H2d was 0.1000 or 10% (table 4.7)and from hypothesis H2h was 0.0998 or 9.98% (table 4.8) which were not relatively high. This could not reflect all independent variables shown in the formula, but could explain the variance of dependent variables since this study collected the disclosed sustainability data, being the reports of firms' operations and their effects on the economy, environment, and society. Furthermore, the result of the test also showed the coefficient regression significantly. Hence, this could conclude the relationship of variables in terms of interaction with each other in order to test the hypothesis (Moksony, 1990; Frost, 2013). To be more concise, this study analyzed more data focusing on individual industries and tested the moderation effect of sustainability disclosure of both SDINDEX_I and SDINDEX_II that moderated between intellectual capital and firm performance measured by Tobin's Q as the results shown in table 4.10-4.11.

(1) In the agricultural and food industry, which consisted of a sample group of 98 observations, the moderation effect was tested. The results showed that the interaction variables, VAIC.SDINDEX_I (0.5069, $p>0.05$) and VAIC.SDINDEX_II (0.9766, $p>0.05$), did not have statistically significant effects. Based on the findings of the hypothesis testing, it can be concluded that the influence of intellectual capital on Tobin's Q in a positive direction is not dependent on the level of sustainable disclosure. This implies that whether companies in the agricultural and food industry disclose their sustainability information at a high, moderate, or low level, the influence of intellectual capital on Tobin's Q showed positively at all levels of the disclosure.

(2) In the technology industry, a sample group of 72 observations was analyzed to test for moderation effects. The results indicated that the interaction variables, VAIC.SDINDEX_I (β = 0.2396, Sig. 0.0471, $p < 0.05$) and VAIC.SDINDEX_II (β = 0.3031, Sig. 0.0103, $p < 0.05$), had statistically significant positive effects on the relationship between intellectual capital and Tobin's Q. However, the direct relationship between intellectual capital and Tobin's Q did not show statistically significant results.

Furthermore, as the level of sustainable disclosure increased, the influence of intellectual capital on Tobin's Q in a positive direction was amplified. This implies that companies that prioritize reporting on sustainability demonstrate a higher impact of intellectual capital on their Tobin's Q measurement. The statistical test results reflect that

in the technology industry, solely investing and developing intellectual capital is insufficient in generating future market performance as measured by Tobin's Q in the following year. Therefore, companies should consider the issue of disclosure practices towards stakeholders, such as increasing the clarity and quality of sustainability reporting, including environmental aspects such as energy management and waste disposal or recycling. This demonstrates the company's awareness of the environmental impacts arising from their operations, which contributes to a stronger impact of intellectual capital on future marketing performance as measured by Tobin's Q.

Thus, it is a better alternative for companies to place importance on both investment and development of intellectual capital and effective communication of sustainable information, ensuring that external stakeholders are well-informed, rather than solely relying on investment and development of intellectual capital while disregarding or being indifferent to the communication of sustainability information.

(3) The services industry comprises a sample group of 200 observations in the study of moderation effects. The statistical analysis revealed significant positive relationships between the interaction variables VAIC.SDINDEX_I (β = 0.1035, Sig. 0.0123, $p<0.05$) and VAIC.SDINDEX_II (β = 0.0817, Sig. 0.0480, $p<0.05$) with the relationship between intellectual capital and Tobin's Q. Moreover, the statistical tests indicated a significantly direct relationship between intellectual capital and Tobin's Q, suggesting that increased investment in intellectual capital by companies leads to higher Tobin's Q in the subsequent year. Additionally, it was found that prioritizing sustainable disclosure levels enhances the positive influence of intellectual capital on Tobin's Q in the following year.

When comparing the characteristics of sustainable disclosure in the services industry, it was observed that the β value for SDINDEX_I was 0.1035, which was higher than the β value for SDINDEX_II of 0.0817. This indicates that SDINDEX_I, which focuses on qualitative explanations or narratives without providing quantitative data or images, demonstrates a higher quality of disclosure to external stakeholders compared to SDINDEX_II. This difference is attributed to the high diversity of business compositions within the services industry, such as the media and publishing sector having a lower proportion of economic, environmental disclosures compared to the health care services sector (as shown in Table 4.3). In the health care services sector, it is necessary to

demonstrate compliance with safety and environmental standards to gain acceptance from patients, service users, employees, and the surrounding community, thereby influencing the hospital's performance in a positive manner.

Moreover, the raw score (before calculating the proportion of sustainable disclosure) of SDINDEX_II, which assigns higher scores when companies disclose information using images, tables, and provide external quality assurance, was found to increase. This further contributes to the observed differences. Additionally, it should be noted that the GRI set of standards does not enforce managing sustainable disclosure; rather, it serves as an optional framework that companies can choose to adopt. Price factors or the expected value derived from reporting remain influential in sustainable disclosure practices (Kusin, 2016).

Based on the overall test results according to hypotheses H2d and H2h, sustainability disclosures show significant relationships with intellectual capital and Tobin's Q, indicating that when companies place greater importance on sustainable disclosure, it leads to an increase in intellectual capital, which in turn positively affects Tobin's Q. Specifically, in the case of SDINDEX_II, a significant direct relationship was found with sales performance.

To further confirm the test results, both in the overall analysis (Tables 4.7-4.8) and the industry-specific analysis (Tables 4.9-4.10), scatterplots were plotted to analyze the direction or trend of the relationship between the level of sustainable disclosure and the relationship between intellectual capital and Tobin's Q. The scatterplot graph consisted of two lines, representing two groups of samples categorized based on whether their SDINDEX_II disclosure ratio was higher or lower than the average value of SDINDEX_II (31.2739 + Std. Deviation 8.9527 = 40.2266). The use of SDINDEX_II as the grouping criterion was due to its statistical significance in the same direction as the sales performance. The group with higher sustainable disclosure was represented by the blue line, while the group with lower sustainable disclosure was represented by the green line.

Table 4.10 Test sustainability disclosure as a moderator variable between intellectual capital and firm performance. The analysis of each industry is based on the collected data from this study

Variables	Ind_Agro			Ind_Tech			Ind_Serv		
	Tobin's Q			Tobin's Q			Tobin's Q		
	β	**Sig.**	**VIF**	***β***	**Sig.**	**VIF**	***β***	**Sig.**	**VIF**
(Constant)	0.8862	0.7435		1.2855	0.5716		1.3256	0.0879	
VAIC	0.4894	0.0003*	1.3725	0.12486	0.2912	1.3276	0.1949	0.0000*	1.1383
SDINDEX_I	-0.1510	0.2461	1.2508	0.1169	0.3373	1.2017	-0.0203	0.6911	1.4874
VAIC.SDINDEX_I	-0.0792	0.5069	1.0226	0.2396	0.0471*	1.0598	0.1035	0.0123*	1.0658
Year2019	-0.1714	0.4649	1.0197	-0.3812	0.0909	1.0276	0.0271	0.7457	1.0135
Leverage	0.0041	0.4925	1.2766	-0.0062	0.2971	1.1930	0.0035	0.1293	1.3983
FirmSize	0.0283	0.8155	1.5710	0.0278	0.7873	1.7234	-0.0507	0.1583	1.8109
Model summary									
F-Stat	3.3612			2.1850			4.0724		
(F-Stat Sig.)	0.0050*			0.0560			0.0010*		
Durbin-Watson	1.5695			1.9933			1.3753		
R^2	0.1831			0.1700			0.1134		
Adjusted R^2	0.1286			0.0921			0.0856		

* Significance levels of 0.05.

Where: VAIC = Value Added Intellectual Coefficient, SDINDEX_I = Sustainability Disclosure, VAIC.SDINDX_I = The interaction between Value Added Intellectual Coefficient and Sustainability Disclosure, Tobin's Q = Tobin's Q at year t+1, Ind_Agro = agriculture and food industry, Ind_Tech = technology industry, Ind_Serv = services industry, Year2019 = year to collect dependent variable is year 2019, Leverage = leverage ratio at year t+1, and FirmSize = the size of firms at year t+1.

Table 4.11 Test sustainability disclosure with explicit result as a moderator variable between intellectual capital and firm performance. The analysis of each industry is based on the collected data from this study.

Variables	Ind_Agro			Ind_Tech			Ind_Serv		
	Tobin's Q			Tobin's Q			Tobin's Q		
	β	**Sig.**	**VIF**	***β***	**Sig.**	**VIF**	***β***	**Sig.**	**VIF**
(Constant)	1.5388	0.5828		0.8669	0.7052		1.4060	0.0687	
VAIC	0.5048	0.0003*	1.3969	0.1077	0.3501	1.3058	0.1912	0.0001*	1.1342
SDINDEX_II	-0.0561	0.6780	1.3274	0.0755	0.5436	1.2980	-0.0128	0.8025	1.4814
VAIC.SDINDEX_II	-0.0035	0.9766	1.0557	0.3031	0.0103*	1.0347	0.0817	0.0480*	1.0837
Year2019	0.0043	0.4723	1.2803	-0.0068	0.2412	1.1597	0.0036	0.1246	1.4104
Leverage	-0.1494	0.5278	1.0200	-0.3688	0.0961	1.0269	0.0237	0.7785	1.0135
FirmSize	-0.0012	0.9921	1.6480	0.0457	0.6588	1.7927	-0.0544	0.1276	1.7610
Model summary									
F-Stat	3.0373			2.6164			3.6307		
(F-Stat Sig.)	0.0090*			0.0250*			0.0020*		
Durbin-Watson	1.5780			2.0988			2.0469		
R^2	0.1680			0.1970			0.1024		
Adjusted R^2	0.1130			0.1217			0.0742		

* Significance levels of 0.05.

Where: VAIC = Value Added Intellectual Coefficient, SDINDEX_II = Sustainability Disclosure with explicit result, VAIC.SDINDX_II = The interaction between Value Added Intellectual Coefficient and Sustainability Disclosure with explicit result, Tobin's Q = Tobin's Q at year t+1, Ind_Agro = agriculture and food industry, Ind_Tech = technology industry, Ind_Serv = services industry, Year2019 = year to collect dependent variable is year 2019, Leverage = leverage ratio at year t+1, and FirmSize = the size of firms at year t+1.

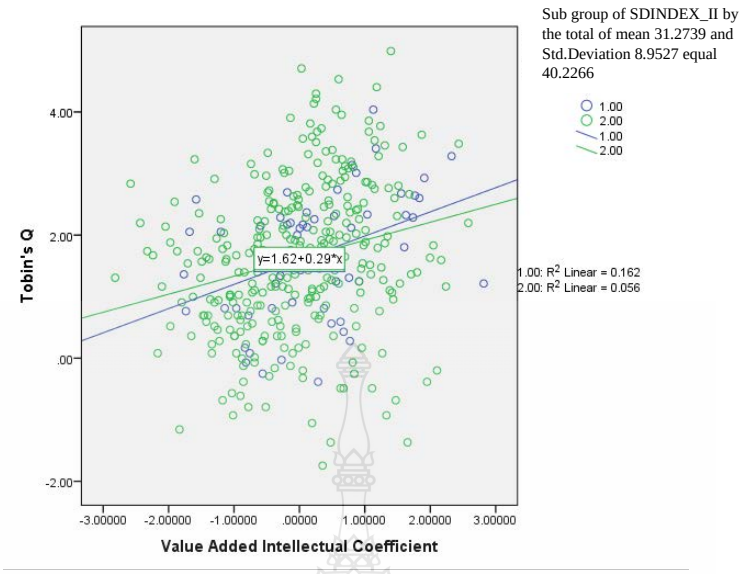


Figure 4.4 The relationship between intellectual capital and tobin's Q of all sampled firms.

Figure 4.4, illustrates the overall result of all industries (food and agriculture, technology, and services) that have utilized intellectual capital and sustainability disclosure well of all those firms with higher sustainability or lower than mean; hence, the value of Tobin's Q increases. Intellectual capital assists in disclosing intangible assets to be more transparent in accordance with their legitimized status leading to having a better perception of image and trust from investors or stakeholders. Therefore, more firms tend to disclose their sustainability which can be found through annual reporting, sustainability reporting, firms' websites, or related channels (Utama & Mirhard, 2016). When carefully analyzing the details, it shows that group 2 has a better tendency than group 1 because of sustainability reporting in Thailand is still voluntary which varies depending on each firm's pattern. As of present, the Stock Exchange of Thailand issues a manual of sustainability reporting for firms listed on the Stock Exchange of Thailand including a guidebook of indicators in sustainability measurement in each industry, covering environmental, social, and governance areas (ESG Metrics). This can be used as a guideline or checklist for reporting transparent information with high quality based on the same standard in accordance with form 56-1 (The Stock Exchange of Thailand, 2022).

From the graph, it can be observed that the scatterplot in Group 2 (green line representing companies with lower-than-average sustainable disclosure) appears to be clustered. This suggests that the level of disclosure among all the sampled companies may not vary significantly or have similar proportions of disclosure. This could be attributed to the fact that during the data collection period in 2018-2019, disclosure was still voluntary, and the legal requirements regarding the disclosure of stakeholder engagement practices were not clearly defined. Several companies, particularly those with limitations in terms of their size and cost considerations, chose to disclose only certain relevant items or adhere to the practices outlined by the regulatory bodies, such as the Stock Exchange of Thailand and the Securities and Exchange Commission. Thus, the limitations or obstacles in reporting were not substantial, especially when compared to other criteria of the GRI standards. The level, content, and format of reporting varied among companies depending on their weighting of importance and the need for clear communication to external stakeholders.

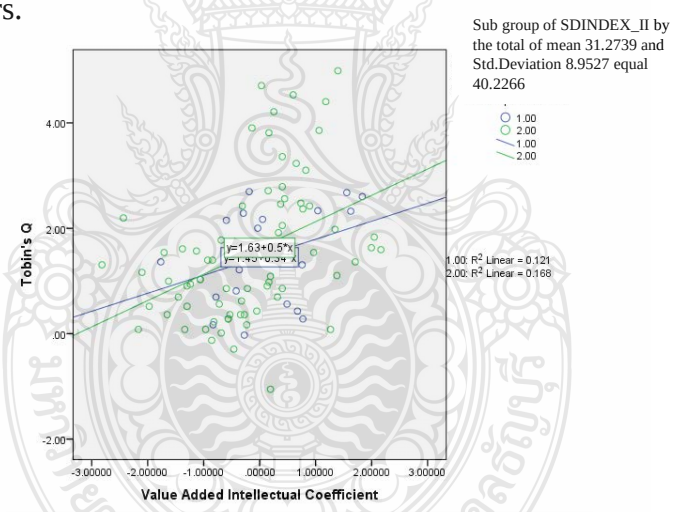


Figure 4.5 The relationship between intellectual capital and tobin's Q of the agriculture and food industry.

Figure 4.5, the highest or the lowest group in the agriculture and food industry, tends to disclose its sustainability data by all means. This enhances intellectual capital and Tobin's Q in the following year after year t. It is evident that the data points in the scatterplot are clustered. This can be attributed to the fact that the study included a relatively small number of observations, with a total of 98 observations in this particular

industry. Furthermore, regardless of whether companies disclosed sustainability information above or below the average proportion, the direction of the relationship between intellectual capital and Tobin's Q remained consistent. This finding is consistent with the statistical test results presented in Tables 4.10-4.11. However, in the case of companies disclosing sustainability information below the average proportion (Group 2), the trend indicates a higher impact of intellectual capital on Tobin's Q compared to companies with higher-than-average sustainability disclosure (Group 1).

Based on the findings in Figure 4.5, a scatterplot analysis was conducted for companies in the agricultural and food industry, as shown in Figures 4.6-4.7. The companies were divided into two groups based on the average company size within the industry, which was 33,134.4308 million baht (Table 4.2). The purpose was to examine whether the results align with the overall analysis. It is worth noting that company size influences the extent of disclosure and has implications for data compilation and public dissemination (Lang & Lundholm, 1993). Larger companies have greater investment potential than smaller ones, which results in greater information disclosure.

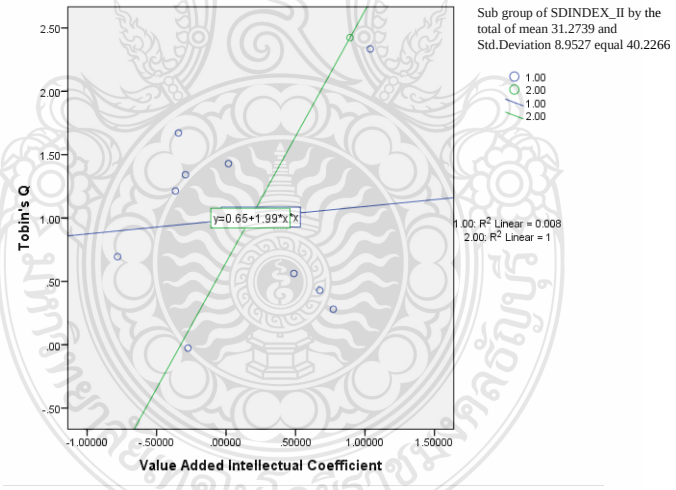


Figure 4.6 The relationship between intellectual capital and tobin's Q of firms larger than the mean firm size in the agriculture and food industry.

From Figure 4.6, it can be observed that companies with larger sizes within the agricultural and food industry have a lower number compared to companies with sizes below the average. This is also depicted in Figure 4.7, which supports the findings presented in Figure 4.5. The graph continues to demonstrate that regardless of whether

companies disclose higher or lower sustainability performance than the average, it still positively influences Tobin's Q. Furthermore, within the group of companies that disclose lower sustainability performance than the average, there is a tendency for a better Tobin's Q compared to the group of companies that disclose higher sustainability performance.

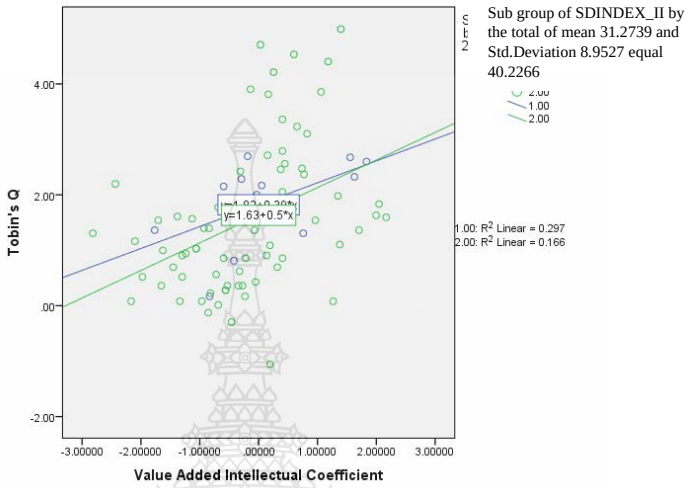


Figure 4.7 The relationship between intellectual capital and tobin's Q of firms smaller than the mean firm size in the agriculture and food industry.

Sustainability disclosures that do not have any influence on the relationship between intellectual capital and Tobin's Q may be attributed to the unclear legal requirements or guidelines for disclosure. For instance, specific standards (economic, environmental, and social) in the food and beverage sector are disclosed if they are expected to impact operations, as shown in Table 4.3. In terms of social dimensions related to labor and customers, the agricultural and food industry places special emphasis on consumer safety due to the higher risks associated with harm to consumers, making safety standards stringent at every stage, from raw material production and processing to distribution and consumption—i.e. from farm to table. Examples include Good Agricultural Practices (GAP), Good Manufacturing Practices (GMP), and Hazard Analysis and Critical Control Points (HACCP), which are regulated by various government agencies to ensure compliance and monitor company practices (Faculty of Food Industry, 2019). Therefore, companies prioritize communication of topics related to food quality, food product quality, and safety to comply with industry regulations and establish customer trust.

Currently, Thailand's agricultural and food industry is significantly affected by environmental and social issues arising from the exploitation of natural resources and the resulting environmental destruction caused by chemical use in agriculture. Investors seek information about environmental performance and the social aspects of businesses, in addition to financial reports (Sustainable Capital Market Development, 2022; Sirikanerat, 2022). Hence, in the future, it may not be sufficient for companies to focus solely on developing or investing in intellectual capital to improve operational performance. If there are clear laws or guidelines for disclosure, companies should present risk information and comprehensive performance in economic and social dimensions, beyond the scope of financial information, to create transparency and gain investor confidence in the industry.

Based on the data analysis, the following recommendations are proposed for companies to consider in their disclosure practices. Non-financial information should be communicated clearly to readers, providing a clearer picture of operational practices. Additionally, the weighting given to disclosure should be expanded to encompass dimensions beyond the social aspect and comply with future legislation. Currently, the Stock Exchange of Thailand has begun releasing reporting guidelines and introducing various indicators for sustainable reporting, which companies can utilize alongside their operational planning (Sustainable Capital Market Development, 2022).

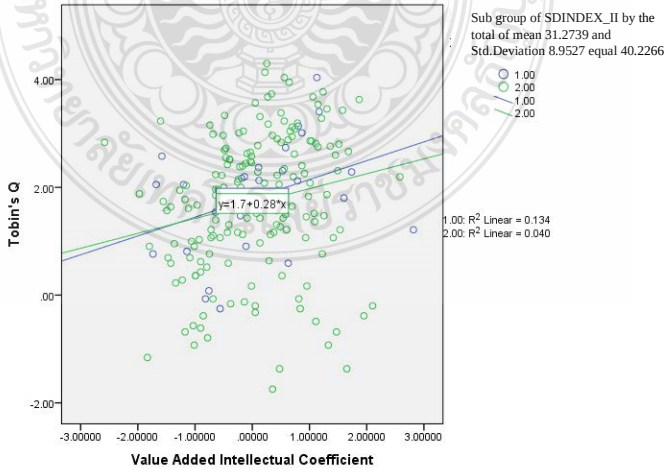


Figure 4.8 The relationship between intellectual capital and tobin's Q of the services industry.

In Figure 4.8, the relationship between intellectual capital and the future marketing performance of the services industry is depicted. The graph exhibits a significant clustering pattern, indicating that companies within the services industry generally have similar levels of overall information disclosure. However, there is a higher proportion of companies (Group 2) with lower sustainability disclosure compared to the average, as opposed to companies (Group 1) with higher sustainability disclosure. Nonetheless, when examining the dimensions of sustainability disclosure within each sector of the services industry, substantial variations are observed. This discrepancy arises due to the diverse nature of service provision. For instance, in the tourism and leisure sector, the overall environmental disclosure proportion is 17.99%, while in the media and publications sector, it is 12.94%. This observation suggests that companies continue to prioritize information disclosure alongside intellectual capital development or investment, aiming to enhance Tobin's Q in the following year. However, it is noteworthy that companies tend to focus their disclosure efforts on specific dimensions that are perceived to be most relevant to their respective businesses.

The services industry benefits from sustainability in terms of reliability gained from customers. Those customers tend to express their impressions through communication channels. Showing good morals and attitude not only affect positively to the business itself, but also enhances the perception of being responsible to society, the environment, the community, employees, and the economy. Organizational leaders have an important role in choosing the right strategies to develop sustainability and encourage their employees to enhance firm performance. This is consistent with Phonsiri et al. (2018) who found the proper management of sustainability by focusing on society and employees could enhance the sustainable development of the Thai economy significantly. This may be from the power of employees who work responsibly for society and the environment following a firm's policy. Hence, hiring employees should be handled ethically and fairly, not just by offering salary, wages, and benefits. Employees can be counted as a firm's valuable assets that lead to success and increase firm performance. Human capital shows a positive relationship with a firm's sustainability. Besides, growing sustainability explains the situation of the firm and assists executives to predict future trends more accurately.Scatterplots were generated in Figures 4.9 and 4.10 to analyze

companies within the services industry, classified into two groups based on the average size of companies in the industry, with a threshold of 23,574.7567 million baht (Table 4.2). The purpose was to examine whether the obtained results align with the overall analysis. The companies were divided into two groups, the first group characterized by higher company size and the second group characterized by lower company size.

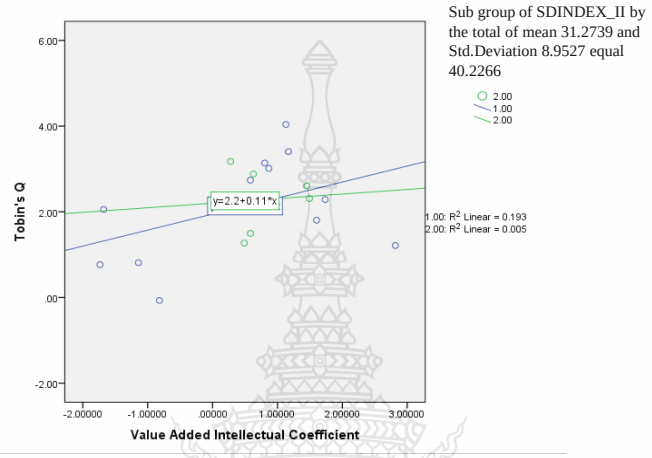


Figure 4.9 The relationship between intellectual capital and tobin's Q of firms larger than the mean firm size in the services industry.

From Figure 4.9, it can be observed that the group of companies with larger sizes than the industry average within the services industry, when disclosing sustainability information to a greater extent, experienced an increase in their Tobin's Q. This indicates that larger companies, such as those in the transportation and logistics and commerce sectors, demonstrated higher levels of sustainability disclosure compared to the average (Group 1). Some companies within this group presented their sustainability practices separately in their annual reports, leading to enhanced understanding among readers regarding their operational practices. This resulted in improved transparency, clarity of communication, and increased stakeholder understanding of the impact of the firm's actions, both direct and indirect. This visibility showcased the company's ability to effectively manage operations, which consequently led to an increased level of information disclosure.

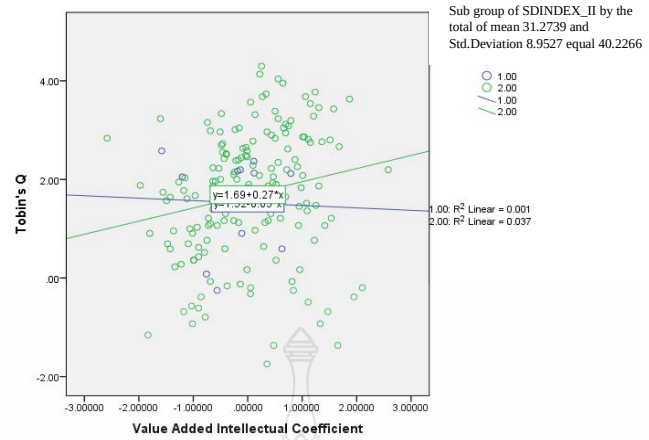


Figure 4.10 The relationship between intellectual capital and tobin's Q of firms smaller than the mean firm size in the services industry.

In contrast, Figure 4.10 reveals that the group of companies with sizes smaller than the industry average within the services industry exhibited relatively clustered data, with a higher number of companies disclosing sustainability information below the average (Group 2) compared to the number of companies disclosing sustainability information above the average (Group 1). This disparity can be attributed to the diverse range of company sizes within each sector. If greater emphasis were placed on increasing the weighting of sustainability disclosure beyond the average, it could lead to increased costs, and companies may not have a clear understanding of the anticipated benefits in the subsequent year (following investment or disclosure). Consequently, companies tend to prioritize disclosure on specific issues that they perceive to have the highest relevance to their operations. This includes issues that could potentially impact stakeholders' benefits, whether directly or indirectly.

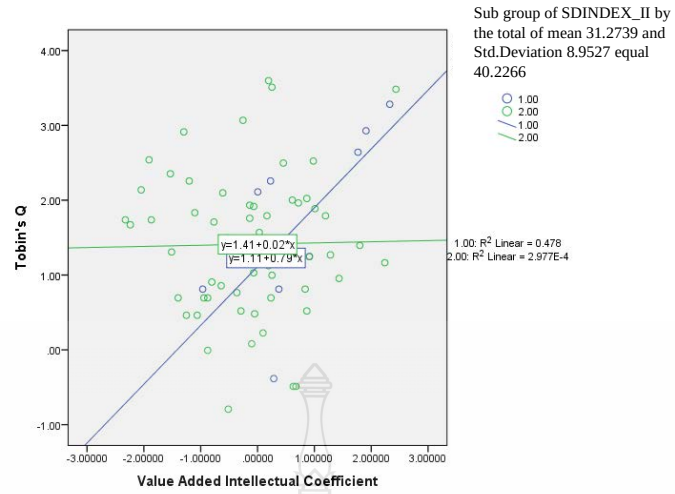


Figure 4.11 The relationship between intellectual capital and Tobin's Q of the technology industry.

According to figure 4.11 the relationship between intellectual capital and Tobin's Q of the technology industry, group 1 (with a higher sustainability value than the mean) shows a gradually increasing tendency of Tobin's Q when firms disclose sustainability, whereas in group 2 (with lower sustainability than the mean), the firm performance is somewhat stable or may increase in the future since there is a lack of sustainability disclosure data; hence, stakeholders or readers cannot see the details of how a firm treats its stakeholders or the performance does not impress the readers. From this point, to have effective firm performance or good results, sustainability needs more time to develop before measuring. The SET announced that technology firms in Thailand should have proper treatment for their labor or employees since most technology firms produce a large number of products in such long hours to fulfill the customer's orders. Certain firms provide a 24-hour service, and that requires staff to service customers such as mobile networks and internet firms, etc. This requirement causes laborers or employees in technology firms to work harder; hence, it is necessary to consider the welfare of laborers or employees (The Stock Exchange of Thailand, 2016). Firms in the technology industry are required to pay more attention to the pattern as well as the content of sustainability reporting since this plays a main role in decision-making. The more transparent, accurate, and complete information the firm makes available, the more it is perceived as being reliable (Sustainable Capital Market Development, 2022).

From figure 4.11, the tendency of these two plot graphs are relatively different. Hence, to clarify this, the technology industry is divided into two groups: 1) a group of firms with higher than the mean firm size, and 2) a group of firms with lower than the mean firm size (41,629.4506 million baht). The reason for this division in terms of firm size is because firms in the technology industry that are larger tend to be able to assess their financial situation better. In addition, larger firms also disclose their sustainability as opposed to smaller firms and increase the larger firms' value (Klaewtanong, 2018). This is consistent with Pinto (2016), who found that the firm size is related to sustainability disclosure, in which large firms disclose their sustainability as opposed to small firms since the larger firms have more pressure from stakeholders.

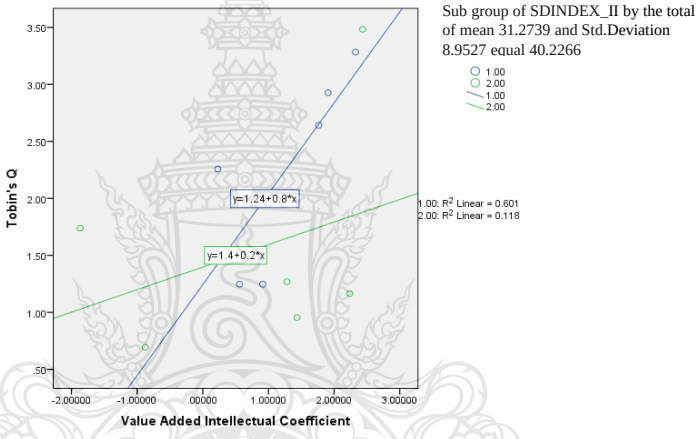


Figure 4.12 The relationship between intellectual capital and Tobin's Q of firms larger than the mean firm size in the technology industry.

From figure 4.12, it can be seen that those firms with a higher than average firm size in the technology industry tend to have an increasing tendency in the same direction. Sustainability disclosure, both higher and lower than average, affects intellectual capital and increases Tobin's Q as well among information technology firms in the technology industry in the total of 13 observations. This also reflects that the strategies for connecting with stakeholders through the disclosure of sustainability affect a firm's intellectual capital and increases its market capitalization value. This is consistent with the result of hypothesis (H2 h) explaining large firms tend to have pressure from stakeholders; hence, the firms disclose their sustainability (part of intellectual capital) such as human rights. Some firms participated in the United Nations initiative, under the agreement about

human rights reporting, how they treat their employees ethically with the belief that if employees are treated well through proper allowance payment, welfare, benefits, and treatment, they tend to drive the operation successfully. In addition, employees who are handicapped due to an accident in the workplace should be treated properly as well.

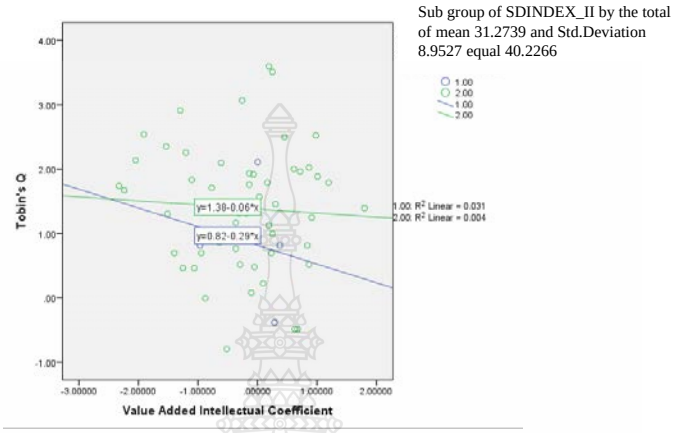


Figure 4.13 The relationship between intellectual capital and Tobin's Q of firms smaller than the mean firm size in the technology industry.

From figure 4.13, it can be seen that for the firms with a lower than average firm size in the technology industry, the graph line tends to decrease in the same direction. Sustainability disclosure. both higher and lower than average, affects intellectual capital and leads to decreases in Tobin's Q. Those firms are in the technology sector based on a total of 59 observations. From the graph line of figure 4.13, the direction of the graph lines is different among those firms having larger size than the average and more observations than figure 4.12. Hence, it is the reason why the graph line, when compared with the ratio of sustainability disclosure, seems to be different among those firms disclosing their sustainability and lower than an average in figure 4.11.

According to the graph in figure 4.13, the lines diverge oppositely; hence, it is not consistent with the result of testing hypothesis H2 h. Nevertheless, it cannot be concluded significantly that when these firms pay less attention to sustainability disclosure, then it affects intellectual capital and leads to a decreasing of Tobin's Q since this study measured the returns only for the year t+1.

Furthermore, for small-sized companies, there may be limitations in terms of the expenses associated with sustainability disclosure. Consequently, an increase in sustainability disclosure is likely to have a negative impact on Tobin's Q, which contrasts with the overall statistical results. However, it is important to note that this research study measures the performance in the subsequent year following the disclosure, or investment, covering only a one-year period. Assessing the success or outcomes of sustainability disclosure and its impact on stakeholders still requires longer-term monitoring and evaluation. A one-year timeframe may not sufficiently reflect the clarity of returns or benefits obtained from sustainability disclosure (Pinta, 2016).

In other words, the graph shows that when the value of intellectual capital develops employees' skills, the firms gain better profits from investing in their assets. The profits gained from shareholders' investment and the perceived value through investors' perspectives become less. Developing intellectual capital takes a long time; hence, the returns within the same year of investing seems to be unclear. This is consistent with Thamprasart (2014) who explained that intellectual capital cannot generate returns in a short period.

4.6 Summary of Hypothesis Testing and Results

The key questions of this study are to test the relationship between intellectual capital, sustainability disclosure, and firm performance.

Table 4.12 Summary of Hypothesis Testing and Results

	Description of Hypotheses	Result
H1a	Intellectual capital has positive relationship with return on assets.	Supported
H1b	Intellectual capital has positive relationship with sales.	Not supported
H1c	Intellectual capital has positive relationship with return on investment capital.	Supported
H1d	Intellectual capital has positive relationship with Tobin's Q	Supported
H2a	Sustainability disclosures (SDINDEX_I) moderates the relationship between intellectual capital and return on assets.	Not supported

Table 4.12 Summary of Hypothesis Testing and Results (Cont.)

	Description of Hypotheses	Result
H2b	Sustainability disclosures (SDINDEX_I) moderates the relationship between intellectual capital and sales.	Not supported
H2c	Sustainability disclosures (SDINDEX_I) moderates the relationship between intellectual capital and return on investment capital.	Not supported
H2d	Sustainability disclosures (SDINDEX_I) moderates the relationship between intellectual capital and Tobin's Q.	Supported
H2e	Sustainability disclosures with explicit result (SDINDEX_II) moderates the relationship between intellectual capital and return on assets.	Not supported
H2f	Sustainability disclosures with explicit result (SDINDEX_II) moderates the relationship between intellectual capital and sales.	Not supported
H2g	Sustainability disclosures with explicit result (SDINDEX_II) moderates the relationship between intellectual capital and return on investment capital.	Not supported
H2h	Sustainability disclosures with explicit result (SDINDEX_II) moderates the relationship between intellectual capital and Tobin's Q.	supported

CHAPTER 5
CONCLUSION AND RECOMMENDATIONS

This chapter is divided into five parts. The first part summarizes the main findings and conclusion of the study. The second part contains a discussion of research questions and discusses the research results. The third part describes the contributions of the study to the literature and stakeholders. The fourth part discusses the limitations of the study. The final part provides recommendations for future research.

5.1 Conclusion

This study aims at investigating the relationship among intellectual capital efficiency, sustainability disclosure, and firm performance which employed evidence from Thai listed firms.

5.1.1 Research purpose and Research Question

The two purposes of the research are as follows: 1) to study the relationship of intellectual capital on firm performance of listed firms on the Stock Exchange of Thailand, and 2) to study the moderating effect of sustainability disclosure on the relationship between intellectual capital and firm performance of listed firms on the Stock Exchange of Thailand.

This study focuses on two research questions and two hypotheses for which the results will be discussed in topic 5.2.

Research Question 1: How does intellectual capital have a relationship with firm performance of firms listed on the Stock Exchange of Thailand?

Research Question 2: What extent does the sustainability disclosure moderate the relationship between intellectual capital and firm performance of listed firms on the Stock Exchange of Thailand?

The analysis was based on 185 firm-year observations which are in the technology industry, agricultural and food industry, and services industry, from the companies listed on the Stock Exchange of Thailand (SET) from 2018 to 2020.

The sustainability disclosure was collected following the GRI standards including 145 items, each of which was coded as 1 when it was reported in the annual

report or sustainability report of a firm, otherwise, it was coded as 0. However, to further examine the relationship, alternative measurement of sustainability disclosure was proposed in this study. By considering these 145 items of GRI standards, some items were excluded when they were not relevant to a particular sector. Any item which was reported in the annual report, or the sustainability report was scored 1, otherwise, it was scored 0. If any item was reported with additional pictures, tabled data, and other information, it was scored 2. Moreover, if any item was reported with additional information being proved by external auditors, it was scored 3.

5.2 Research Results and Discussion

This section provides research discussion regarding the research questions and hypotheses testing.

5.2.1 Research Question 1: How does intellectual capital have a relationship to firm performance of firms listed on the Stock Exchange of Thailand?

The analysis of the multiple regression equations reveals that intellectual capital has a positive effect on the future performance of accounting operations, measured by ROA (Return on Assets) and ROIC (Return on Invested Capital), as well as on the performance of marketing operations for the following year, measured by Tobin's Q, which is statistically significant at the 0.05 level.

These findings align with the theoretical perspective of the Resource-based View, which suggests that a firm's ability to generate superior performance stems not from external factors such as industry characteristics but from internal processes within the organization. According to Barney (1991), intellectual capital is a critical resource for companies, characterized by its value, rarity, and inimitability. It becomes a factor that creates a competitive advantage and ultimately contributes to the firm's performance. Intellectual capital encompasses human capital, structural capital, and physical capital working together to enhance efficiency, leading to favorable outcomes for the organization (Nimtrakoon, 2015; Fahimi & Fakhari, 2017; Rashid et al., 2018; Jaroenthip, 2018; Onumah & Duho, 2018).

The positive relationship between intellectual capital and the firm's accounting performance in the following year, as measured by ROA and ROIC, indicates that

intellectual capital plays a crucial role in generating future returns and providing a competitive edge to the company (Utama & Mirhard, 2016). Being a significant resource embedded within individuals, intellectual capital results from skill development, knowledge, and experiential learning that cannot be easily replicated or substituted. Therefore, companies need to establish internal knowledge management to retain and harness these knowledge assets (Baima et al., 2020; Yustyarani & Yuliana, 2020; Phromsuwansiri et al., 2022; Sucena et al., 2022) and effectively manage intellectual capital. Such management of intellectual capital becomes a crucial factor enabling firms to compete and enhance future returns (Thamprasart & Phajongwong, 2018; Primasari, 2019).

Furthermore, the study reveals that intellectual capital also affects the firm's marketing performance in the following year, indicating that investors can perceive the impact of intellectual capital on the company's performance resulting from the utilization of intellectual capital, knowledge, skills, and innovation generated by employees. Effective management of intellectual capital and the maximization of its benefits contribute to competitive advantage, leading to increased future market performance (Hejazi et al., 2016; Primasari, 2019; Alnsour et al., 2021).

However, these studies have not yet examined the influence of sustainability disclosure, and it remains unclear whether these effects change when a company discloses its sustainability practices. This leads to the objective of investigating the impact of sustainability disclosure on these relationships as described in research question 2 (as explained in section 5.1.1). Analyzing the regulatory influence of Sustainability Disclosure on these relationships is yet to be explored.

5.2.2 Research Question 2: What extent does the sustainability disclosure moderate the relationship between intellectual capital and firm performance of firms listed on the Stock Exchange of Thailand?

(1) The results of the statistical analysis using multiple regression revealed that sustainability disclosure and sustainability disclosure with explicit results both significantly influence the relationship between intellectual capital and the future marketing performance measured by Tobin's Q, at a significant level of 0.05. This implies that the relationship between intellectual capital and Tobin's Q becomes stronger

when companies disclose their sustainability performance. Further analysis, considering different industries, showed that the technology and services industries align with the overall findings. However, the food and agriculture industry did not show any significant influence of sustainability disclosure on the relationship. Instead, only intellectual capital showed a direct relationship with future marketing performance in that industry.

(2) The study aligns with stakeholder theory (Buallay, 2022) by emphasizing the importance of companies disclosing information to demonstrate their alignment with the needs of relevant stakeholders. Additionally, it supports Setiany's (2021) findings that such disclosures, beyond financial reporting, contribute to increased market performance. Moreover, the study suggests that sustainability disclosure is an integral part of achieving success and legitimacy in managing stakeholder interests, as proposed by legitimacy theory (Klaewtanong, 2018; Kurniawan & Muharam, 2021; Bansal et al., 2021; Carvajal and Nadeem, 2022).

(3) The data collection for this study utilized two methods to ensure the quality and significance of the disclosed information from the selected companies, which represented the maximum diversity in the study. When comparing the moderating role of sustainability disclosure on the relationship between intellectual capital and future marketing performance (Tobin's Q) in the following year, it was found that sustainability disclosure based on GRI Standard had a greater influence on the relationship compared to sustainability disclosure with explicit result by virtue of additional information, such as pictures, tables, and other information being proved by external auditors. This can be attributed to the relatively higher costs associated with sustainable practices, as well as the additional expenses incurred for external auditors' verification of sustainability practices. Consequently, most companies that do not require such certification perceive it as unnecessary. As a result, companies that disclose their sustainability performance through additional information have an average score of 31.27%, which is lower than the average score of 63.36% for sustainability disclosure in narrative form.

(4) The findings of these studies are significant for the practices of the technology and service industries. It was found that there is an increasing relationship between intellectual capital and Tobin's Q for the following year when companies disclose greater sustainability. This indicates that if companies prioritize investment in

intellectual capital development and align it with increased disclosure of sustainability practices, it leads to an increase in marketing performance in the subsequent year. This is due to the current rapidly changing environment within the industry, where investors may not be aware of intellectual capital investments as there is still no standardized recognition of intellectual capital as an asset. However, when there is disclosure regarding sustainability practices that consider stakeholders' interests in the company's business operations, it increases investor confidence in the company (Klaewtanong & Petchchedchoo, 2018; Klaewtanong, 2020). Therefore, it is important for companies to be aware of and prioritize disclosure. From the study, it was found that the technology and service industries primarily emphasize social disclosure, followed by economic disclosure and environmental disclosure. This could be further considered in the specific items that researchers use to collect data on company sustainability disclosure (refer to Appendix C) to ensure clear and comprehensive information provided by the company, which supports investment decision-making by investors considering investing in the company, leading to increased market returns (Setiany, 2021).

(5) However, in the food and agriculture industry, a direct positive relationship was found between intellectual capital and Tobin's Q in the following year, but no significant influence was found for sustainability disclosure on the relationship between intellectual capital and Tobin's Q. This indicates that supporting policies to develop intellectual capital investments in companies have an impact on future performance. However, the influence of disclosure, which has no impact, could be recommended for companies to consider in their planning. Increasing the importance of disclosing information to address the concerns of stakeholders related to the company's own business operations, particularly in environmental and social issues, is crucial. Investors seek information on the company's environmental and social performance, so company disclosures may need to include information on risk and the effectiveness of ESG-related operations (Sirikanerat, 2022). It can be observed that the proportion of environmental disclosure, whether in the form of sustainability disclosure or GRI standard with explicit results, is still relatively low. Companies may consider incorporating additional items that should be disclosed to reflect genuine sustainable practices.

(6) The industry analysis reveals differences across industries. Additionally, the analysis of large and small companies shows that large companies with high sustainability performance have higher marketing performance compared to those with low sustainability performance. However, in the small company group, there is no significant difference in sustainability performance. This may be due to the need for companies to consider the costs and benefits associated with sustainability activities, as these activities require a relatively high level of capital investment. Small companies may lack the necessary financial resources to engage in such investments and, therefore, focus less on sustainability-related activities.

(7) The Stock Exchange of Thailand and relevant authorities may collaboratively consider best practices for intellectual capital disclosure, including sustainability disclosure and knowledge-sharing for implementing practices aligned with the GRI Standard. This would enable companies to easily adopt and reflect their genuine sustainability practices to the greatest extent.

Moreover, the study on sustainability disclosure and its impact on the relationship between intellectual capital and accounting performance did not find a significant correlation between intellectual capital disclosure and accounting performance. This is because, within the context of Thailand, sustainability disclosure is voluntary, allowing companies to choose different approaches to sustainability practices. The implementation of sustainability activities incurs costs for businesses that may not always justify the anticipated benefits or may have unpredictable consequences. Therefore, some companies may not prioritize extensive disclosure, and the timing of accounting performance measurement may only capture differences or clear relationships observed in previous studies (Haji & Anifowose, 2016; Ganesan et al., 2017; Pinta, 2016; Carvajal & Nadeem, 2022).

5.3 Contributions of the Study

5.3.1 Academic Contribution

Based on the findings of the study, it was found that intellectual capital has an impact on both accounting and marketing performance when the company emphasizes

sustainability disclosure. The following points provide insights into the implications of the study:

(1) This study supports the resource-based view theory and suggests that the ability to generate superior performance is not solely driven by external factors. By effectively investing and managing intellectual capital, companies can gain a competitive advantage and outperform its competitors in both accounting and marketing performance. Companies should consider allocating appropriate budgets for intellectual capital development, considering the size of the company that positively impacts both accounting and marketing performance.

(2) The disclosure of sustainability performance is driven by the need to meet the expectations of stakeholders and comply with global societal policies. Moreover, having combined intellectual capital influences marketing performance positively. This finding aligns with stakeholder theory and legitimacy theory indicating that investors value companies that operate in line with societal expectations for sustainable utilization of natural resources and human capital. This, in turn, affects the market value of the company.

(3) Intellectual capital, as an internal resource, plays a crucial role in company performance. Once a company prioritizes and systematically plans for the development of intellectual capital, it can create a sustainable competitive advantage. This strengthens the company's overall performance and contributes to consistent improvements.

(4) In this study, data collection and sustainability disclosure were based on the GRI Standards. Two approaches were compared: the first approach was sustainability disclosure, collected data based on GRI criteria; and the second approach was sustainability disclosure with explicit results as an enhancement of the first approach. The second approach provided additional scoring at the time that companies provided deeper and clearer disclosure, such as using visual representations or tables to supplement descriptive explanations. External agencies were involved to ensure the quality of the disclosure, thereby demonstrating the company's commitment to the quality of its information disclosure. This enables readers of the report to have a clear understanding of the company's practices and their impact on stakeholders.

In conclusion, this study highlights the importance of intellectual capital and sustainability disclosure in influencing accounting and marketing performance. It supports the resource-based view theory, stakeholder theory, and legitimacy theory. Companies should invest in and manage their intellectual capital effectively while prioritizing the quality of their sustainability disclosure. These practices can lead to improved performance and a stronger market position.

5.3.2 Practical Contribution

The findings of this study are beneficial for various groups in the following ways.

First, for directors and management, it emphasizes the importance of intellectual capital and sustainable practices in generating future competitiveness. By focusing on intellectual capital development and sustainable initiatives, companies can create a competitive advantage for themselves in the long run. Furthermore, disclosing key operational information related to intellectual capital development and sustainability can attract investor interest, as they can then consider investing in companies that prioritize human resource development and contribute to innovation and sustainable development.

Second, for regulators, the Stock Exchange of Thailand and the Securities and Exchange Commission should support and promote companies that voluntarily disclose their sustainable performance. While some companies currently excel in disclosing their sustainable practices, others may not accord it as much importance as they should. Therefore, it may be necessary to establish measures that incentivize and encourage companies to disclose information about their sustainable operations effectively. This can help enhance transparency and accountability in the market.

Third, for accounting regulators, professional accounting bodies, such as the Federation of Accounting Professions under the Royal Patronage of His Majesty the King and other relevant organizations should support companies in recognizing the significance of intellectual capital. Since intellectual capital is not currently recognized as an asset, guidelines or frameworks could be established to encourage companies to disclose information related to intellectual capital. This would provide investors with valuable insights for predicting a company's future performance and making investment

decisions. Additionally, disclosing sustainability-related information is crucial for collaborative efforts in preserving the environment.

Fourth, for investors, they should consider investing in companies that invest in intellectual capital as it enhances corporate innovative capabilities and influences future performance. Moreover, transparency regarding a company's sustainable practices indicates its commitment to long-term existence while considering its impact on society, communities, and the world. Evaluating a company's sustainability disclosures is a way to assess its overall resilience and sustainability.

Fifth, for society and community, attention should be given to the disclosure of a company's sustainable practices, as it impacts their quality of life. Supporting companies that prioritize sustainability initiatives stimulates them to consider the importance of sustainable operations. It also encourages companies to contribute positively to environmental preservation and sustainability.

5.4 Limitations of the Study

The limitations and restrictions are presented as follows.

5.4.1 The study's sample group consisted of companies registered in the Stock Exchange of Thailand across the agriculture and food, technology, and service industries. Data was collected from the period of 2018 to 2020. When utilizing the study's findings in different time periods, it is essential to consider the varying environmental conditions.

5.4.2 This study utilized the Value Added Intellectual Coefficient (VAIC) as a method to measure intellectual capital. VAIC is a standardized model that utilizes financial statement figures, thereby ensuring reliability, having been audited by accountants. It also provides easy accessibility to data. However, it indirectly measures the value of intellectual capital (Thamprasart & Phajongwong; 2018, Jaroenthip, 2018). Therefore, assessing the value of intellectual capital in generating future value for companies is considered a challenge for research and development (Martín-de et al., 2019).

5.4.3 In this study, sustainability disclosure is measured as a percentage of disclosure based on the full score for each industry. However, certain irrelevant issues to a specific industry were excluded from the calculation. It should be noted that the stock

exchange has developed industry-specific guidelines, but these guidelines were not used directly in this research.

5.4.4 The data on sustainability disclosure used to analyze the moderating effect represents a composite score from all disclosed dimensions. This composite score is utilized to forecast the subsequent year's operational performance. The study does not separately analyze the dimensions of sustainability disclosure or differentiate the positive or negative impacts on the environment. Furthermore, the analysis is based solely on the content disclosed by the companies.

5.4.5 The research findings show an R-squared value of less than 20% for the moderating effect testing of sustainability disclosure on the relationship between intellectual capital and marketing performance. This may be due to the inclusion of diverse industries with differing characteristics in the study, as well as the potential influence of other relevant factors on operational performance.

5.5 Suggestion for Further Research

Based on gaps in the study findings, there are several possibilities for future research in the following areas.

5.5.1 Intellectual capital measurement: the current methods of measuring intellectual capital vary, and these different measurement approaches may lead to variations in operational outcomes. When the business environment changes rapidly, there may be a need for additional factors to reflect the development of human capital in line with the contemporary baseline.

5.5.2 Sustainability practices during the study period: in the initial stages of studying sustainability, voluntary disclosure and investigating only three industries may result in variations across industries. Therefore, future research may need to explore industries that have different environmental impacts, providing diverse perspectives.

5.5.3 The study found that the size of a company affects intellectual capital and its impact on operational outcomes. Future research in this field may emphasize studying different-sized companies as a guideline for development, particularly for large and medium-sized companies.

5.5.4 The study observed a limited explanation of marketing performance regarding intellectual capital and sustainability disclosure. Additional factors such as shareholder structure and board of directors' composition, which play a role in determining operational policies, may require further investigation.

5.5.5 The sustainability disclosure which is written following the GRI Standards could be evaluated to determine the extent to which it can function as a moderator variable of the relationship between intellectual capital and firm performance for year t+1. Further research may study for longer periods, such as three years or five years, to consider how sustainability disclosure affects long-term firm performance and also collect sustainability data with methods other than the GRI Standards, such as the KLD index, DJSI, ESG matrix combined with the GRI Standards, and so on. In addition, it is worth considering environmental issues, such as raising awareness of environmental consciousness, carbon footprint for organization, carbon offsetting program and carbon credit to reduce the effect of greenhouse gas emissions, when firms in their best endeavors, have tried every way to reduce greenhouse gas emissions.

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APPENDICES

APPENDIX A

Multiple Regression Analysis Assumption

Multiple Regression Analysis Assumption

In assessing the linear regression assumption, it was found that the data did not violate the linear regression assumption. This is explained in (1) to (5) as follows:

(1) The expected value of the standard error or E (εi) = 0 shows the result of testing in each hypothesis regarding the details in table: Residual statistic. The Residual shows Mean = 0 in an appendix.

(2) Frequency distributions of the standard error shows a normality distribution (see table: Tests of Normality) in which all variables are displayed in an appendix.

(3) Analyze scatterplot of standardized residual of dependent variables in each hypothesis to ensure that there is no heteroscedasticity problem. The result will be displayed in normal o-plot and histogram of all variables that measured as dependent variable.

(4) Test the independent standard error with Durbin-Watson coefficient value is between 1 and 3 with test indicating that an autocorrelation does not exist (Field, 2009, p.220-221). The result will be displayed under each hypothesis' s result.

(5) Variance Inflation Factors (VIF) are lower than 10, indicating no multicollinearity problems among variables. The result will be displayed under each hypothesis' s result.

Therefore, multiple regression method was used to test hypotheses. The list of analysis no. (1) – (3) will be displayed in this appendix, nine parts of hypothesizes. The analysis no. (2) the normality test table is the last part. The option no. (4)-(5) is already explained in chapter 4.

1. Hypothesis 1: Intellectual capital has the positive relationship to firm performance of listed firms on the Stock Exchange of Thailand.

Hypothesis 1a: Intellectual capital has a positive relationship to Return On Assets.

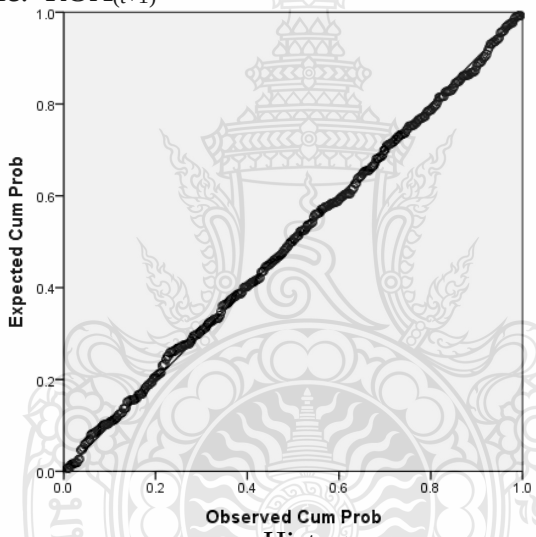
Residuals Statistics [a]

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	-15.6235	17.7714	3.2491	5.5410	366.00
Residual	-26.7441	31.6762	0.0000	8.4316	366.00
Std. Predicted Value	-3.4060	2.6209	0.0000	1.0000	366.00
Std. Residual	-3.1457	3.7258	0.0000	0.9918	366.00

a. Dependent Variable: $ROA_{(t+1)}$

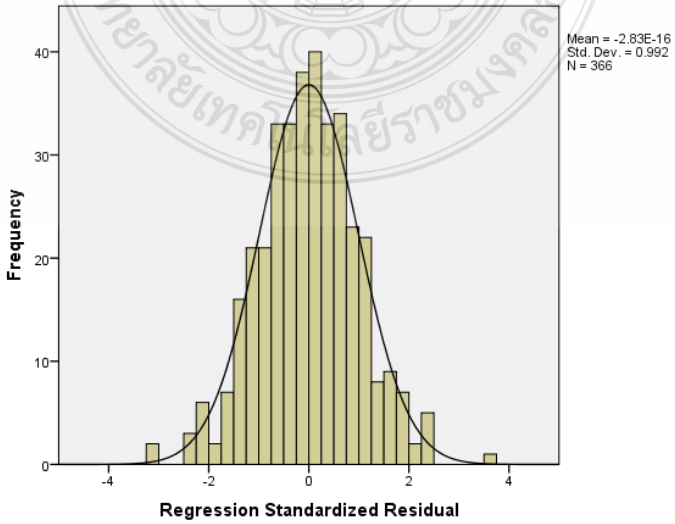
Normal P-P Plot of Regression Standardized Residual

Dependent Variable: $ROA_{(t+1)}$



Histogram

Dependent Variable: $ROA_{(t+1)}$



Hypothesis 1b: Intellectual capital has a positive relationship to Sales.

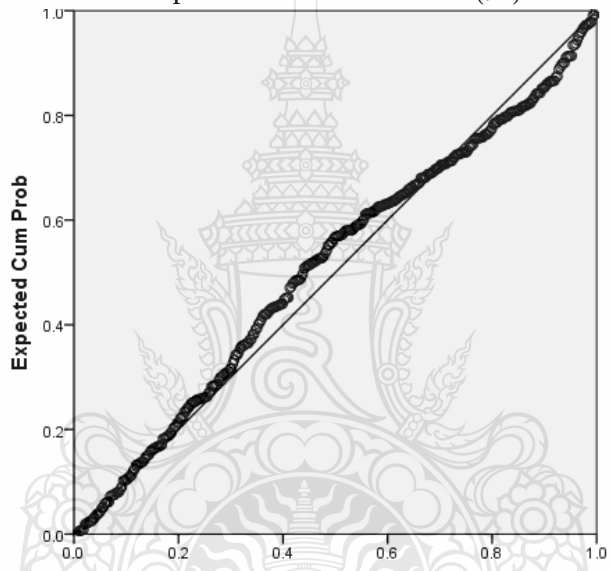
Residuals Statistics [a]

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	18.4771	26.2690	22.0978	1.4285	367.00
Residual	-3.55905	3.8359	0.0000	0.8693	367.00
Std. Predicted Value	-2.535	2.9200	0.0000	1.0000	367.00
Std. Residual	-4.060	4.3762	0.0000	0.9918	367.00

a. Dependent Variable: $Sales_{(t+1)}$

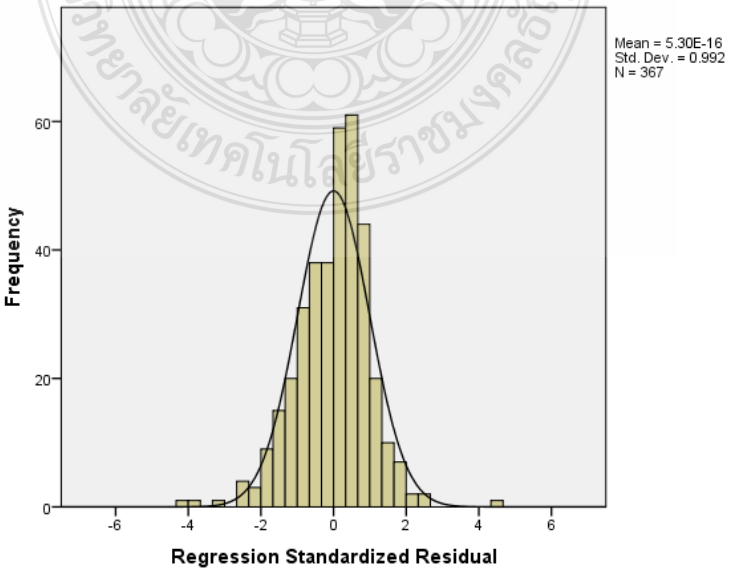
Normal P-P Plot of Regression Standardized Residual

Dependent Variable: $Sales_{(t+1)}$



Histogram

Dependent Variable: $Sales_{(t+1)}$



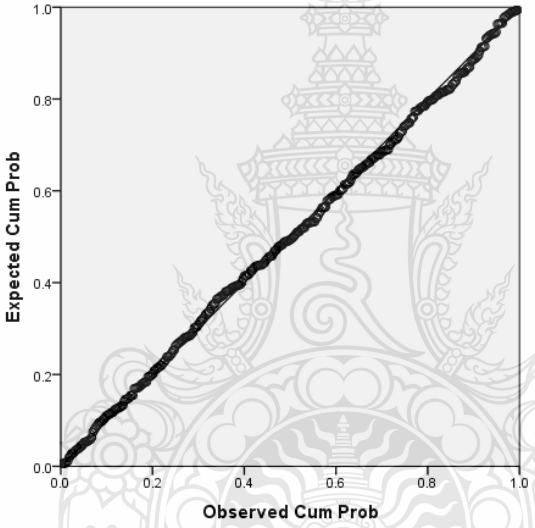
Hypothesis 1c: Intellectual capital has a positive relationship to Return On Investment Capital.

Residuals Statistics [a]

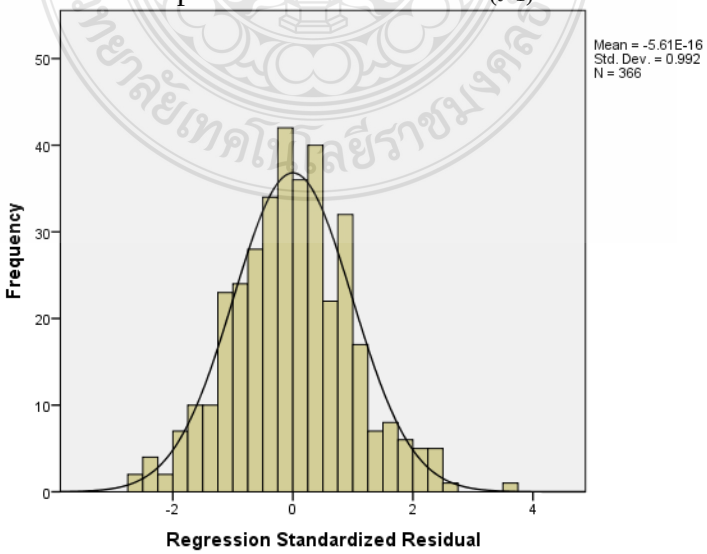
	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	-38.7448	48.9262	5.3147	14.4860	366.00
Residual	-69.4685	96.9815	0.0000	26.3343	366.00
Std. Predicted Value	-3.0415	3.0106	0.0000	1.0000	366.00
Std. Residual	-2.6162	3.6523	0.0000	0.9917	366.00

a. Dependent Variable: $ROIC_{(t+1)}$

Normal P-P Plot of Regression Standardized Residual
Dependent Variable: $ROIC_{(t+1)}$



Histogram
Dependent Variable: $ROIC_{(t+1)}$



Hypothesis 1d: Intellectual capital has a positive relationship to Tobin's Q

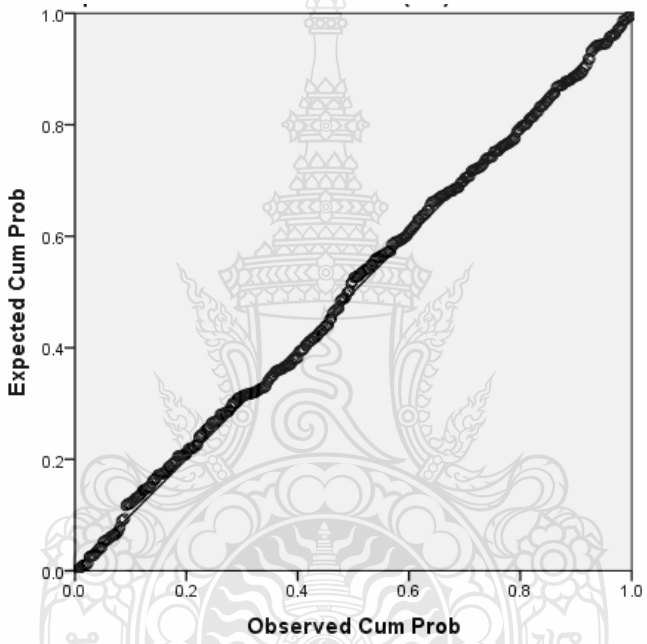
Residuals Statistics [a]

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	0.6000	2.5722	1.6229	0.3469	366.00
Residual	-3.5835	3.0443	0.0000	1.1480	366.00
Std. Predicted Value	-2.9487	2.7364	0.0000	1.0000	366.00
Std. Residual	-3.0958	2.6299	0.0000	0.9917	366.00

a. Dependent Variable: Tobin's $Q_{(t+1)}$

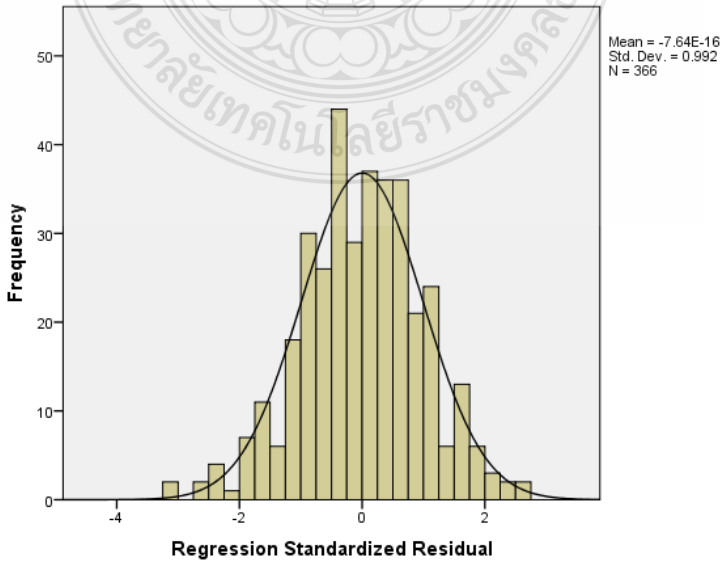
Normal P-P Plot of Regression Standardized Residual

Dependent Variable: Tobin's $Q_{(t+1)}$



Histogram

Dependent Variable: Tobin's $Q_{(t+1)}$



2. Hypothesis 2: Sustainability disclosure moderates the relationship between intellectual capital and firm performance such that the effect of intellectual capital and firm performance is stronger when firms possess high sustainability disclosure than when firms possess low sustainability disclosure of listed firms on the Stock Exchange of Thailand.

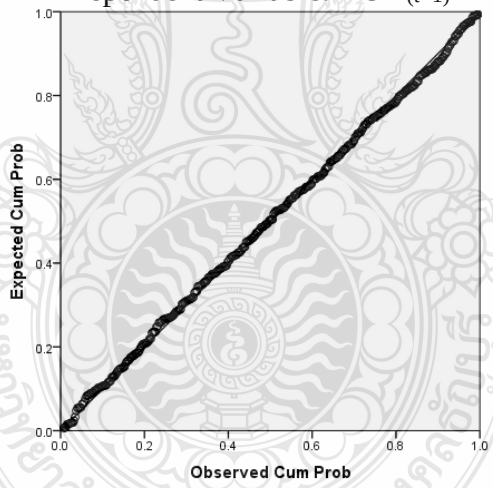
Hypothesis 2a: Sustainability Disclosures (SDINDEX_I) moderates the relationship between intellectual capital and Return On Assets.

Residuals Statistics [a]

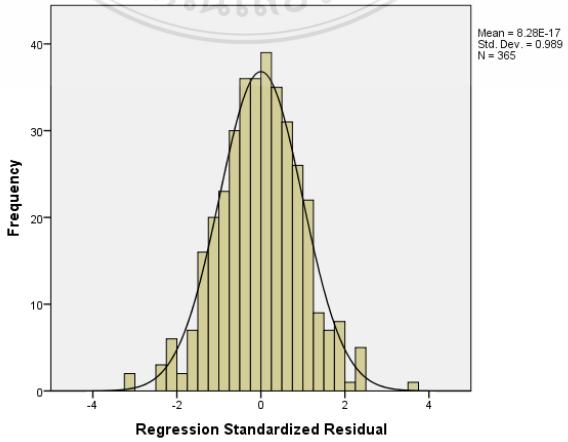
	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	-15.8093	18.0916	3.2131	5.5583	365.00
Residual	-26.7777	31.4237	0.0000	8.4086	365.00
Std. Predicted Value	-3.4224	2.6768	0.0000	1.0000	365.00
Std. Residual	-3.1494	3.6958	0.0000	0.9889	365.00

a. Dependent Variable: $ROA_{(t+1)}$

Normal P-P Plot of Regression Standardized Residual
Dependent Variable: $ROA_{(t+1)}$



Histogram
Dependent Variable: $ROA_{(t+1)}$



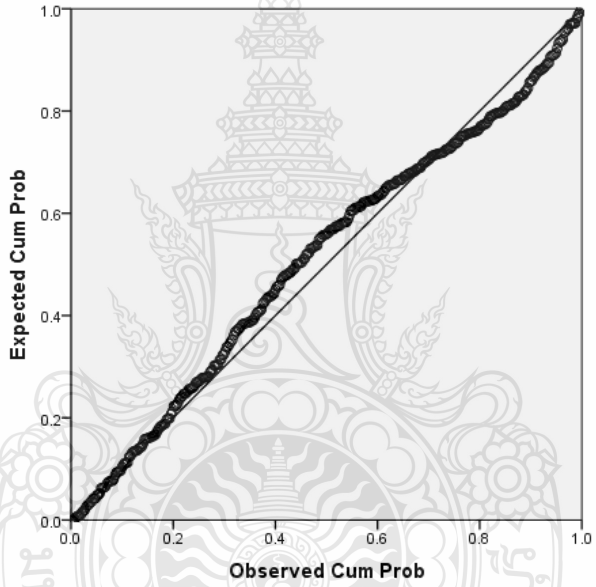
Hypothesis 2b: Sustainability Disclosures (SDINDEX_I) moderates the relationship between intellectual capital and Sales.

Residuals Statistics [a]

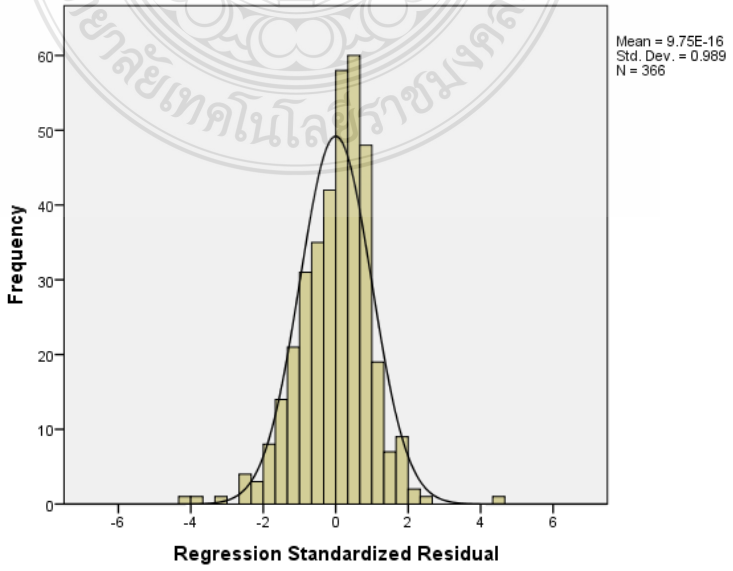
	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	18.5006	26.2684	22.0907	1.4257	366.00
Residual	-3.63583	3.8455	0.0000	0.8676	366.00
Std. Predicted Value	-2.518	2.9303	0.0000	1.0000	366.00
Std. Residual	-4.145	4.3837	0.0000	0.9890	366.00

a. Dependent Variable: $Sales_{(t+1)}$

Normal P-P Plot of Regression Standardized Residual
Dependent Variable: $Sales_{(t+1)}$



Histogram
Dependent Variable: $Sales_{(t+1)}$



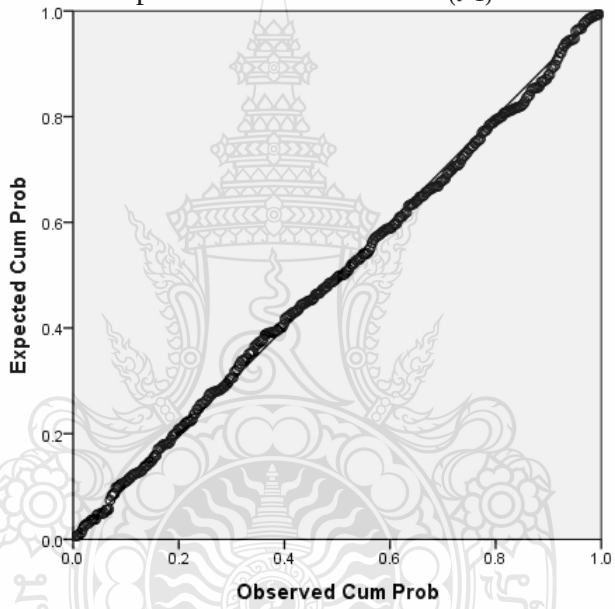
Hypothesis 2c: Sustainability Disclosures (SDINDEX_I) moderates the relationship between intellectual capital and Return On Investment Capital.

Residuals Statistics [a]

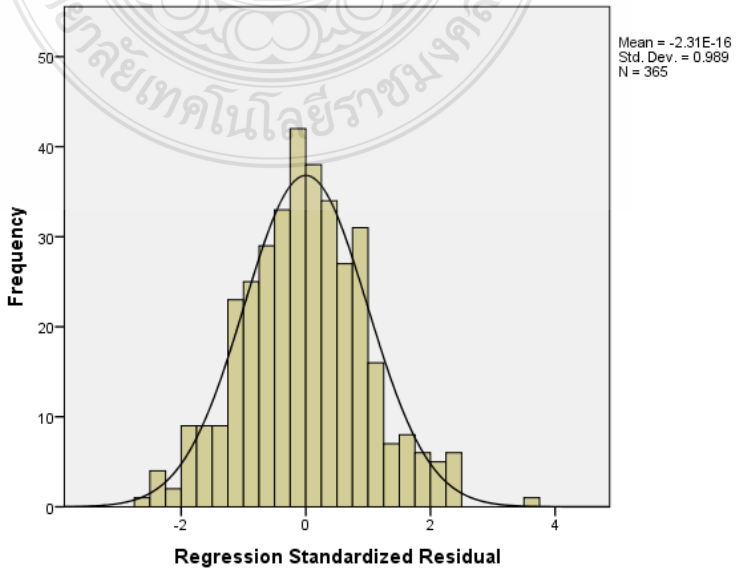
	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	-39.0224	49.2620	5.2136	14.5083	365.00
Residual	-69.4632	96.4079	0.0000	26.2980	365.00
Std. Predicted Value	-3.0490	3.0361	0.0000	1.0000	365.00
Std. Residual	-2.6122	3.6255	0.0000	0.9889	365.00

a. Dependent Variable: $ROIC_{(t+1)}$

Normal P-P Plot of Regression Standardized Residual
Dependent Variable: $ROIC_{(t+1)}$



Histogram
Dependent Variable: $ROIC_{(t+1)}$



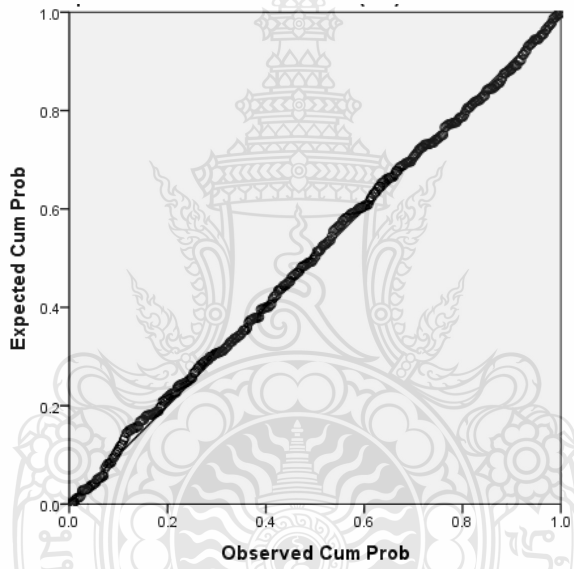
Hypothesis 2d: Sustainability Disclosures (SDINDEX_I) moderates the relationship between intellectual capital and Tobin's Q.

Residuals Statistics [a]

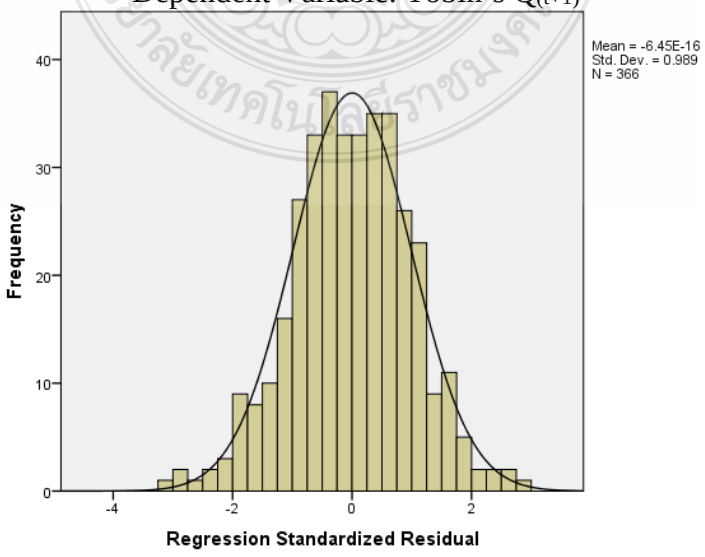
	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	0.5298	3.4251	1.6229	0.3792	366.00
Residual	-3.5737	3.2058	0.0000	1.1377	366.00
Std. Predicted Value	-2.8827	4.7523	0.0000	1.0000	366.00
Std. Residual	-3.1065	2.7867	0.0000	0.9890	366.00

a. Dependent Variable: Tobin's $Q_{(t+1)}$

Normal P-P Plot of Regression Standardized Residual
Dependent Variable: Tobin's $Q_{(t+1)}$



Histogram
Dependent Variable: Tobin's $Q_{(t+1)}$



Hypothesis 2e: Sustainability Disclosures with explicit result (SDINDEX_II) moderates the relationship between intellectual capital and Return On Assets.

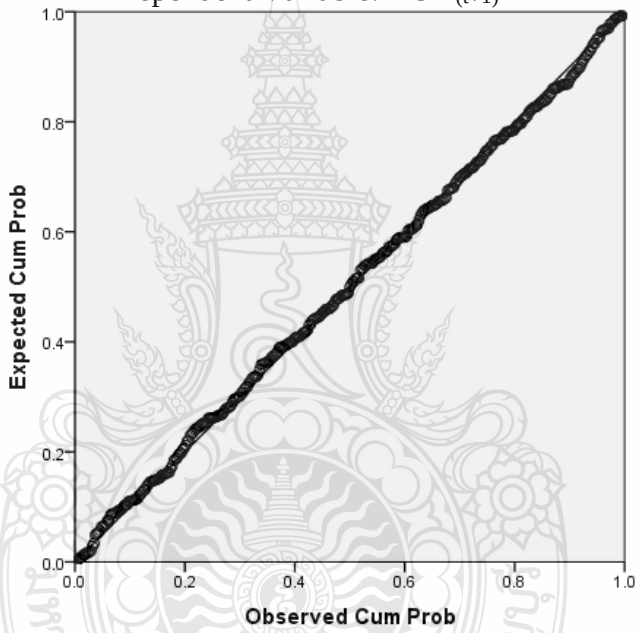
Residuals Statistics [a]

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	-15.4569	17.8678	3.2131	5.5635	365.00
Residual	-26.9645	31.3441	0.0000	8.4052	365.00
Std. Predicted Value	-3.3558	2.6341	0.0000	1.0000	365.00
Std. Residual	-3.1726	3.6879	0.0000	0.9889	365.00

a. Dependent Variable: $ROA_{(t+1)}$

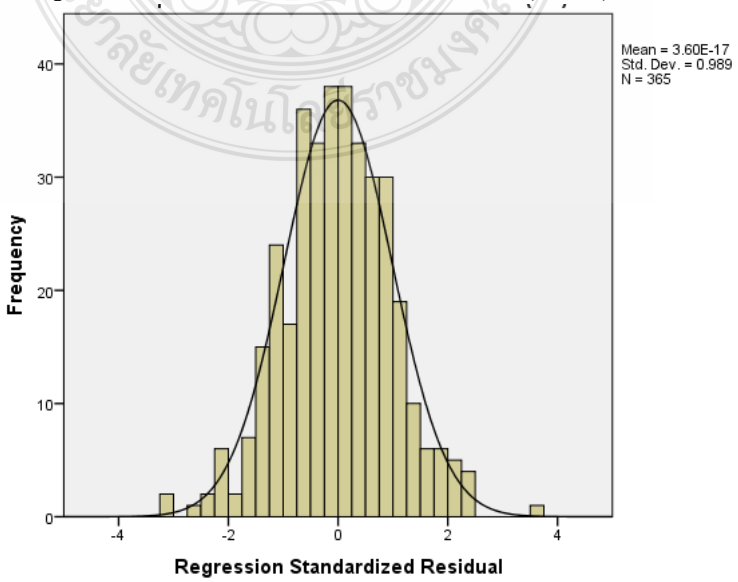
Normal P-P Plot of Regression Standardized Residual

Dependent Variable: $ROA_{(t+1)}$



Histogram

Dependent Variable: Return On Assets (ROA)



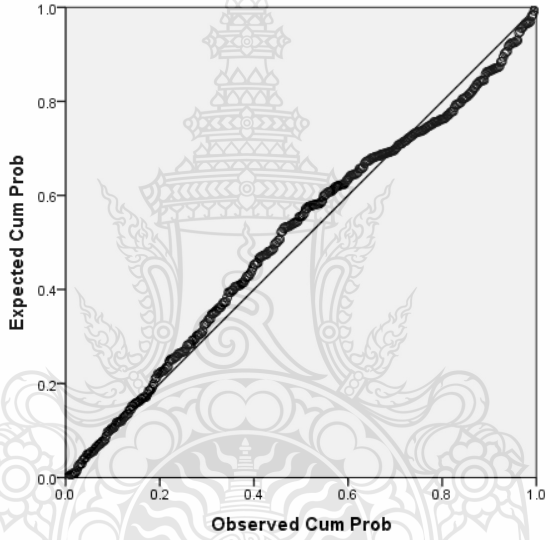
Hypothesis 2f: Sustainability Disclosures with explicit result (SDINDEX_II) moderates the relationship between intellectual capital and Sales.

Residuals Statistics [a]

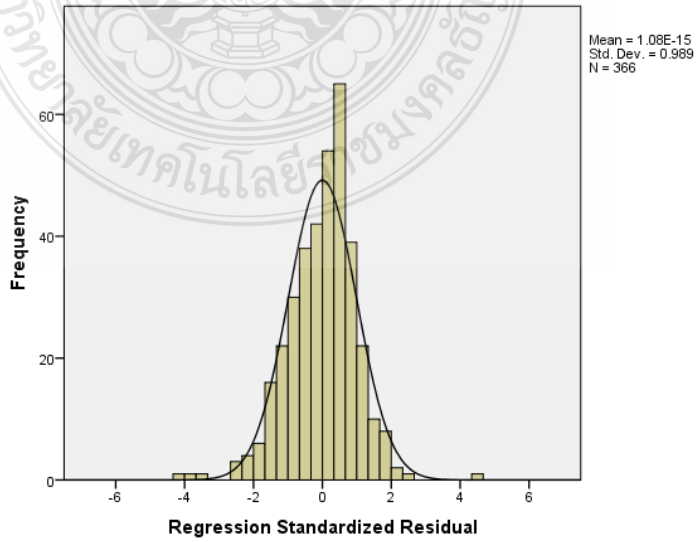
	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	18.4721	26.2253	22.0907	1.4290	366.00
Residual	-3.59022	3.8668	0.0000	0.8621	366.00
Std. Predicted Value	-2.532	2.8933	0.0000	1.0000	366.00
Std. Residual	-4.119	4.4359	0.0000	0.9890	366.00

a. Dependent Variable: $Sales_{(t+1)}$

Normal P-P Plot of Regression Standardized Residual
Dependent Variable: $Sales_{(t+1)}$



Histogram
Dependent Variable: $Sales_{(t+1)}$



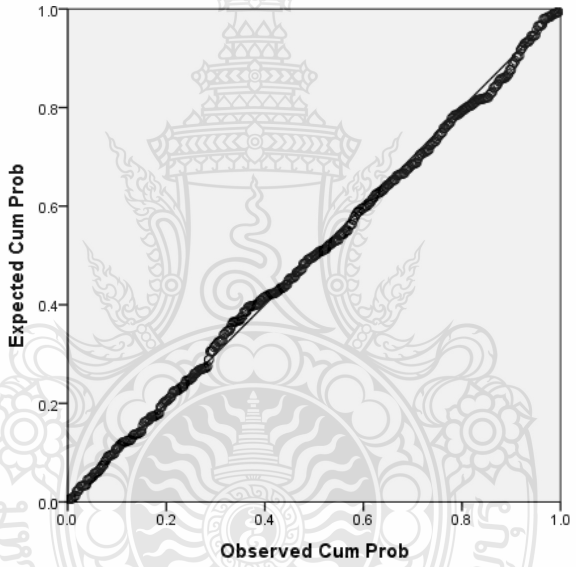
Hypothesis 2g: Sustainability Disclosures with explicit result (SDINDEX_II) moderates the relationship between intellectual capital and Return On Investment Capital.

Residuals Statistics [a]

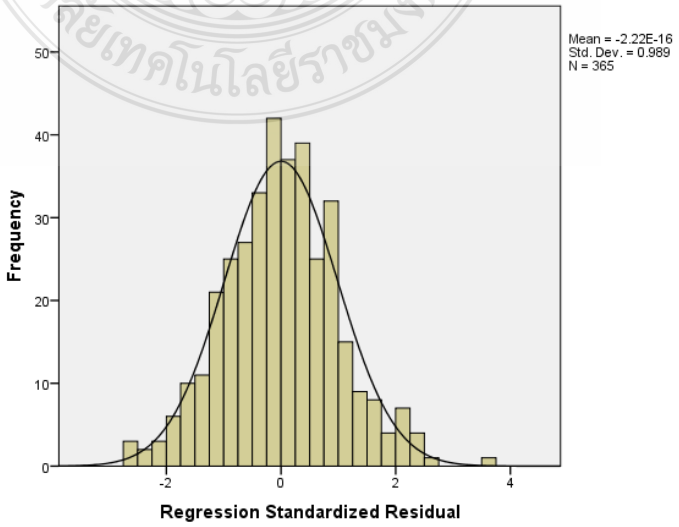
	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	-38.2818	48.5138	5.2136	14.5447	365.00
Residual	-70.4356	96.0425	0.0000	26.2778	365.00
Std. Predicted Value	-2.9905	2.9770	0.0000	1.0000	365.00
Std. Residual	-2.6508	3.6145	0.0000	0.9889	365.00

a. Dependent Variable: $ROIC_{(t+1)}$

Normal P-P Plot of Regression Standardized Residual
Dependent Variable: $ROIC_{(t+1)}$



Histogram
Dependent Variable: $ROIC_{(t+1)}$



Hypothesis 2h: Sustainability Disclosures with explicit result (SDINDEX_II) moderates the relationship between intellectual capital and Tobin's Q.

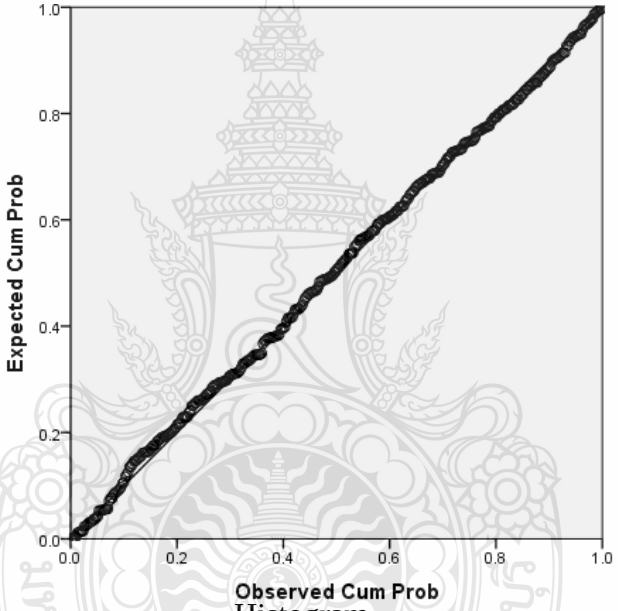
Residuals Statistics [a]

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	0.4456	3.4773	1.6229	0.3788	366.00
Residual	-3.5836	3.0899	0.0000	1.1379	366.00
Std. Predicted Value	-3.1083	4.8958	0.0000	1.0000	366.00
Std. Residual	-3.1147	2.6856	0.0000	0.9890	366.00

a. Dependent Variable: Tobin's $Q_{(t+1)}$

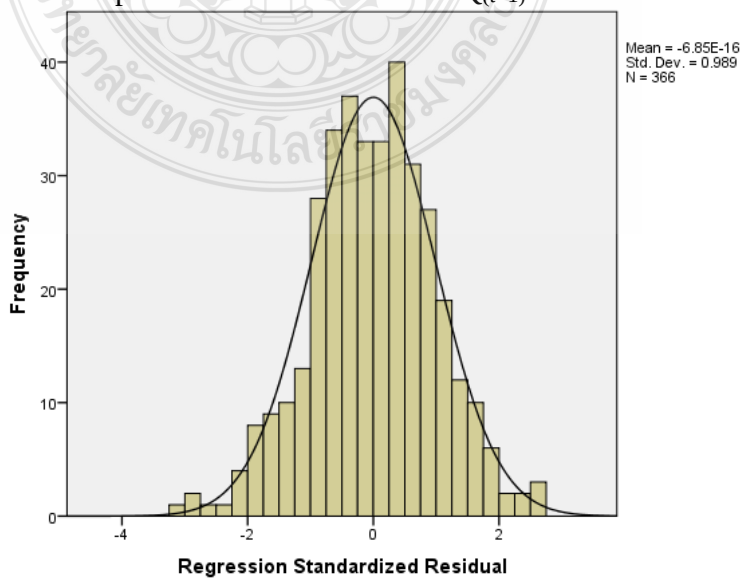
Normal P-P Plot of Regression Standardized Residual

Dependent Variable: Tobin's $Q_{(t+1)}$



Histogram

Dependent Variable: Tobin's $Q_{(t+1)}$



3. Normality test

Normality test	Kolmogorov-Smirnov[a]		
	Statistic	df	Sig.
VACA	.028	363	.200*
VAHC	.011	363	.200*
STVA	.015	363	.200*
VAIC	.011	363	.200*
SDINDEX_I	.014	363	.200*
SDINDEX_II	.012	363	.200*
ROA(t+1)	.006	363	.200*
Sales(t+1)	.005	363	.200*
ROIC(t+1)	.005	363	.200*
Tobin's Q (t+1)	.016	363	.200*

*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

Where: VACA = Value Added Capital Employed, VAHC = Value Added Human Capital, STVA = Value Added Structural Capital, VAIC = Value Added Intellectual Coefficient, SDINDEX_I = Sustainability Disclosure, SDINDEX_I = Sustainability Disclosure, SDINDEX_II = Sustainability Disclosure with explicit result, ROA = Return on Assets at year t+1, Sales = Natural logarithm net sales at year t+1, ROIC = Return on Investment Capital at year t+1, Tobin’s Q = Tobin’s Q at year t+1

APPENDIX B

List of sample firms

Appendix B List Sample firms

No	Agricultural and Food Industry	No	Technology Industry	No	Service Industry
1	APURE	1	ADVANC	1	AAV
2	ASIAN	2	AIT	2	AHC
3	BR	3	ALT	3	AMARIN
4	CBG	4	BLISS	4	AQUA
5	BRR	5	CCET	5	AS
6	CFRESH	6	DELTA	6	ASIA
7	CHOTI	7	DTAC	7	ASIMAR
8	CM	8	FORTH	8	BCH
9	CPF	9	HANA	9	BDMS
10	CPI	10	HUMAN	10	BEAUTY
11	EE	11	ILINK	11	BEC
12	GFPT	12	INET	12	BEM
13	HTC	13	INTUCH	13	BH
14	ICHI	14	JAS	14	BIG
15	KBS	15	JMART	15	BJC
16	KSL	16	JTS	16	BTS
17	KTIS	17	KCE	17	BWG
18	LEE	18	METCO	18	CENTEL
19	LST	19	MFEC	19	CHG
20	M	20	MSC	20	CMR
21	MALEE	21	NEX	21	COM7
22	MINT	22	PT	22	CPALL
23	NER	23	SAMART	23	CSR
24	OISHI	24	SAMTEL	24	CSS
25	OSP	25	SDC	25	DTC
26	PB	26	SIS	26	EKH
27	PM	27	SMT	27	ERW
28	PPPM	28	SVI	28	FE
29	PRG	29	SVOA	29	FN
30	SAPPE	30	SYMC	30	FTE
31	SFP	31	SYNEX	31	GENCO
32	SNP	32	TEAM	32	GLOBAL
33	SORKON	33	THCOM	33	GPI
34	SSC	34	TRUE	34	GRAMMY
35	SSF	35	TWZ	35	GRAND
36	SST	36	W	36	HMPRO
37	STA			37	III

Appendix B List Sample firms (Cont.)

No	Agricultural and Food Industry	No	Technology Industry	No	Service Industry
38	TC			38	IT
39	TFG			39	JWD
40	TFMAMA			40	KAMART
41	TIPCO			41	KDH
42	TKN			42	KWC
43	TRUBB			43	LOXLEY
44	TU			44	LPH
45	TVO			45	LRH
46	TWPC			46	MACO
47	UPOIC			47	MAJOR
48	UVAN			48	MAKRO
49	VPO			49	MANRIN
				50	MATCH
				51	MATI
				52	MC
				53	M-CHAI
				54	MCOT
				55	MEGA
				56	MIDA
				57	MONO
				58	MPIC
				59	NEW
				60	NMG
				61	NTV
				62	OHTL
				63	PLANB
				64	PORT
				65	POST
				66	PR9
				67	PRAKIT
				68	PRINC
				69	PRM
				70	PRO
				71	PSL
				72	RAM
				73	RCL
				74	RJH

Appendix B List Sample firms
(Cont.)

No	Agricultural and Food Industry	No	Technology Industry	No	Service Industry
				75	ROH
				76	RPH
				77	RS
				78	RSP
				79	SE-ED
				80	SHANG
				81	SINGER
				82	SISB
				83	SKR
				84	SPC
				85	SPI
				86	SVH
				87	TBSP
				88	TH
				89	THAI
				90	THG
				91	TKS
				92	TSTE
				93	TTA
				94	VGI
				95	VIBHA
				96	VIH
				97	WAVE
				98	WICE
				99	WORK
				100	WPH

APPENDIX C

Criteria for estimation Sustainability Disclosure

Appendix C Criteria for estimation Sustainability Disclosure

Descriptive	Agricultural and Food Industry		Technology Industry	
	Food and Beverage	**Agricbusiness**	**Information technology and Communication**	**Electronic component**
GRI 101: Foundation-Starting point for using the GRI Standards				
GRI 102: General Disclosures-To report contextual information about an organization	✓	✓	✓	✓
Organizational profile				
GRI 102-1 Name of the organization	✓	✓	✓	✓
GRI 102-2 Activities, brands, products, and services	✓	✓	✓	✓
GRI 102-3 Location of headquarters	✓	✓	✓	✓
GRI 102-4 Location of operations	✓	✓	✓	✓
GRI 102-5 Ownership and legal form	✓	✓	✓	✓
GRI 102-6 Markets served	✓	✓	✓	✓
GRI 102-7 Scale of the organization	✓	✓	✓	✓

Appendix C Criteria for estimation Sustainability Disclosure (Cont.)

Descriptive	Agricultural and Food Industry		Technology Industry	
	Food and Beverage	**Agricbusiness**	**Information technology and Communication**	**Electronic component**
GRI 102-8 Information on employees and other workers	✓	✓	✓	✓
GRI 102-9 Supply chain	✓	✓	✓	✓
GRI 102-10 Significant changes to the organization and its supply chain	✓	✓	✓	✓
GRI 102-11 Precautionary Principle or approach	✓	✓	✓	✓
GRI 102-12 External initiatives	✓	✓	✓	✓
GRI 102-13 Membership of associations Strategy	✓	✓	✓	✓
GRI 102-14 Statement from senior decision-maker	✓	✓	✓	✓

Appendix C Criteria for estimation Sustainability Disclosure (Cont.)

Descriptive	Agricultural and Food Industry		Technology Industry	
	Food and Beverage	**Agricbusiness**	**Information technology and Communication**	**Electronic component**
GRI 102-15 Key impacts, risks, and opportunities	✓	✓	✓	✓
Ethics and integrity				
GRI 102-16 Values, principles, standards, and norms of behavior	✓	✓	✓	✓
GRI 102-17 Mechanisms for advice and concerns about ethics	✓	✓	✓	✓
GRI 102-18 Governance structure	✓	✓	✓	✓
GRI 102-19 Delegating authority	✓	✓	✓	✓
GRI 102-20 Executive-level responsibility for economic, environmental, and social topics	✓	✓	✓	✓
GRI 102-21 Consulting stakeholders on economic, environmental, and social topics	✓	✓	✓	✓

Appendix C Criteria for estimation Sustainability Disclosure (Cont.)

Descriptive	Agricultural and Food Industry		Technology Industry	
	Food and Beverage	**Agricbusiness**	**Information technology and Communication**	**Electronic component**
GRI 102-22 Composition of the highest governance body and its committees	✓	✓	✓	✓
GRI 102-23 Chair of the highest governance body	✓	✓	✓	✓
GRI 102-24 Nominating and selecting the highest governance body	✓	✓	✓	✓
GRI 102-25 Conflicts of interest	✓	✓	✓	✓
GRI 102-26 Role of highest governance body in setting purpose, values, and strategy	✓	✓	✓	✓
GRI 102-27 Collective knowledge of highest governance body	✓	✓	✓	✓

Appendix C Criteria for estimation Sustainability Disclosure (Cont.)

Descriptive	Agricultural and Food Industry		Technology Industry	
	Food and Beverage	**Agricbusiness**	**Information technology and Communication**	**Electronic component**
GRI 102-28 Evaluating the highest governance body's performance	✓	✓	✓	✓
GRI 102-29 Identifying and managing economic, environmental, and social impacts	✓	✓	✓	✓
GRI 102-30 Effectiveness of risk management processes	✓	✓	✓	✓
GRI 102-31 Review of economic, environmental, and social topics	✓	✓	✓	✓
GRI 102-32 Highest governance body's role in sustainability reporting	✓	✓	✓	✓
GRI 102-33 Communicating critical concerns	✓	✓	✓	✓

Appendix C Criteria for estimation Sustainability Disclosure (Cont.)

Descriptive	Agricultural and Food Industry		Technology Industry	
	Food and Beverage	**Agricbusiness**	**Information technology and Communication**	**Electronic component**
GRI 102-34 Nature and total number of critical concerns	✓	✓	✓	✓
GRI 102-35 Remuneration policies	✓	✓	✓	✓
GRI 102-36 Process for determining remuneration	✓	✓	✓	✓
GRI 102-37 Stakeholders' involvement in remuneration	✓	✓	✓	✓
GRI 102-38 Annual total compensation ratio	✓	✓	✓	✓
GRI 102-39 Percentage increase in annual total compensation ratio	✓	✓	✓	✓
Stakeholder engagement				
GRI 102-40 List of stakeholder groups	✓	✓	✓	✓

Appendix C Criteria for estimation Sustainability Disclosure (Cont.)

Descriptive	Agricultural and Food Industry		Technology Industry	
	Food and Beverage	**Agricbusiness**	**Information technology and Communication**	**Electronic component**
GRI 102-41 Collective bargaining agreements	✓	✓	✓	✓
GRI 102-42 Identifying and selecting stakeholders	✓	✓	✓	✓
GRI 102-43 Approach to stakeholder engagement	✓	✓	✓	✓
GRI 102-44 Key topics and concerns raised	✓	✓	✓	✓
GRI 102-45 Entities included in the consolidated financial statements	✓	✓	✓	✓
GRI 102-46 Defining report content and topic Boundaries	✓	✓	✓	✓
GRI 102-47 List of material topics	✓	✓	✓	✓
GRI 102-48 Restatements of information	✓	✓	✓	✓

Appendix C Criteria for estimation Sustainability Disclosure (Cont.)

Descriptive	Agricultural and Food Industry		Technology Industry	
	Food and Beverage	**Agricbusiness**	**Information technology and Communication**	**Electronic component**
GRI 102-49 Changes in reporting	✓	✓	✓	✓
GRI 102-50 Reporting period	✓	✓	✓	✓
GRI 102-51 Date of most recent report	✓	✓	✓	✓
GRI 102-52 Reporting cycle	✓	✓	✓	✓
GRI 102-53 Contact point for questions regarding the report	✓	✓	✓	✓
GRI 102-54 Claims of reporting in accordance with the GRI Standards	✓	✓	✓	✓
GRI 102-55 GRI content index	✓	✓	✓	✓
GRI 102-56 External assurance	✓	✓	✓	✓
GRI 103: Management Approach-To report the management approach for each material topic				

Appendix C Criteria for estimation Sustainability Disclosure (Cont.)

Descriptive	Agricultural and Food Industry		Technology Industry	
	Food and Beverage	**Agricbusiness**	**Information technology and Communication**	**Electronic component**
GRI 103-1 Explanation of the material topic and its Boundary	✓	✓	✓	✓
GRI 103-2 The management approach and its components	✓	✓	✓	✓
GRI 103-3 Evaluation of the management approach	✓	✓	✓	✓
GRI 201: Economic Performance				
GRI 201-1 Direct economic value generated and distributed	✓	✓	✓	✓
GRI 201-2 Financial implications and other risks and opportunities due to climate change	✓	✓	✓	✓
GRI 201-3 Defined benefit plan obligations and other retirement plans	✓	✓	✓	✓
GRI 201-4 Financial assistance received from government	✓	✓	✓	✓

Appendix C Criteria for estimation Sustainability Disclosure (Cont.)

Descriptive	Agricultural and Food Industry		Technology Industry	
	Food and Beverage	**Agricbusiness**	**Information technology and Communication**	**Electronic component**
GRI 202: Market Presence				
GRI 202-1 Ratios of standard entry level wage by gender compared to local minimum wage	✓	×	✓	✓
GRI 202-2 Proportion of senior management hired from the local community	✓	×	✓	✓
GRI 203: Indirect Economic Impacts				
GRI 203-1 Infrastructure investments and services supported	✓	✓	✓	✓
GRI 203-2 Significant indirect economic impacts	✓	✓	✓	✓
GRI 204: Procurement Practices				
GRI 204-1 Proportion of spending on local suppliers	✓	✓	✓	✓

Appendix C Criteria for estimation Sustainability Disclosure (Cont.)

Descriptive	Agricultural and Food Industry		Technology Industry	
	Food and Beverage	**Agricbusiness**	**Information technology and Communication**	**Electronic component**
GRI 205: Anti-corruption				
GRI 205-1 Operations assessed for risks related to corruption	✓	✓	✓	✓
GRI 205-2 Communication and training about anti-corruption policies and procedures	✓	✓	✓	✓
GRI 205-3 Confirmed incidents of corruption and actions taken	✓	✓	✓	✓
GRI 206: Anti-competitive Behavior				
GRI 206-1 Legal actions for anti-competitive behavior, anti-trust, and monopoly practices	✓	✓	✓	✓
GRI 301: Materials				
GRI 301-1 Materials used by weight or volume	✓	✓	✓	✓
GRI 301-2 Recycled input materials used	✓	✓	✓	✓
GRI 301-3 Reclaimed products and their packaging materials	✓	✓	✓	✓

Appendix C Criteria for estimation Sustainability Disclosure (Cont.)

Descriptive	Agricultural and Food Industry		Technology Industry	
	Food and Beverage	**Agricbusiness**	**Information technology and Communication**	**Electronic component**
GRI 302: Energy				
GRI 302-1 Energy consumption within the organization	✓	✓	✓	✓
GRI 302-2 Energy consumption outside of the organization	✓	✓	✓	✓
GRI 302-3 Energy intensity	✓	✓	✓	✓
GRI 302-4 Reduction of energy consumption	✓	✓	✓	✓
GRI 302-5 Reductions in energy requirements of products and services	✓	✓	✓	✓
GRI 303: Water and Effluents				
GRI 303-1 Interactions with water as a shared resource	✓	✓	✓	✓
GRI 303-2 Management of water discharge-related impacts	✓	✓	✓	✓

Appendix C Criteria for estimation Sustainability Disclosure (Cont.)

Descriptive	Agricultural and Food Industry		Technology Industry	
	Food and Beverage	**Agricbusiness**	**Information technology and Communication**	**Electronic component**
GRI 303-3 Water withdrawal	✓	✓	✓	✓
GRI 303-4 Water discharge	✓	✓	✓	✓
GRI 303-5 Water consumption	✓	✓	✓	✓
GRI 304: Biodiversity				
GRI 304-1 Operational sites owned, leased, managed in, or adjacent to, protected areas and areas of high biodiversity value outside protected areas	✓	✓	✓	✓
GRI 304-2 Significant impacts of activities, products, and services on biodiversity	✓	✓	✓	✓
GRI 304-3 Habitats protected or restored	✓	✓	✓	✓
GRI 304-4 IUCN Red List species and national conservation list species with habitats in areas affected by operations	✓	✓	✓	✓

Appendix C Criteria for estimation Sustainability Disclosure (Cont.)

Descriptive	Agricultural and Food Industry		Technology Industry	
	Food and Beverage	**Agricbusiness**	**Information technology and Communication**	**Electronic component**
GRI 305: Emissions				
GRI 305-1 Direct (Scope 1) GHG emissions	✓	✓	✓	✓
GRI 305-2 Energy indirect (Scope 2) GHG emissions	✓	✓	✓	✓
GRI 305-3 Other indirect (Scope 3) GHG emissions	✓	✓	✓	✓
GRI 305-4 GHG emissions intensity	✓	✓	✓	✓
GRI 305-5 Reduction of GHG emissions	✓	✓	✓	✓
GRI 305-6 Emissions of ozone-depleting substances (ODS)	✓	✓	✓	✓
GRI 305-7 Nitrogen oxides (NOX), sulfur oxides (SOX), and other significant air emissions	✓	✓	✓	✓
GRI 306: Effluents and Waste				

Appendix C Criteria for estimation Sustainability Disclosure (Cont.)

Descriptive	Agricultural and Food Industry		Technology Industry	
	Food and Beverage	**Agricbusiness**	**Information technology and Communication**	**Electronic component**
GRI 306-1 Water discharge by quality and destination	✓	✓	✓	✓
GRI 306-2 Waste by type and disposal method	✓	✓	✓	✓
GRI 306-3 Significant spills	✓	✓	✓	✓
GRI 306-4 Transport of hazardous waste	✓	✓	✓	✓
GRI 306-5 Water bodies affected by water discharges and/or runoff	✓	✓	✓	✓
GRI 307: Environmental Compliance				
GRI 307-1 Non-compliance with environmental laws and regulations	✓	✓	✓	✓
GRI 308: Supplier Environmental Assessment				
GRI 308-1 New suppliers that were screened using environmental criteria	✓	✓	✓	✓

Appendix C Criteria for estimation Sustainability Disclosure (Cont.)

Descriptive	Agricultural and Food Industry		Technology Industry	
	Food and Beverage	**Agricbusiness**	**Information technology and Communication**	**Electronic component**
GRI 308-2 Negative environmental impacts in the supply chain and actions taken	✓	✓	✓	✓
GRI 401: Employment				
GRI 401-1 New employee hires and employee turnover	✓	✓	✓	✓
GRI 401-2 Benefits provided to full-time employees that are not provided to temporary or part-time employees	✓	✓	✓	✓
GRI 401-3 Parental leave	✓	✓	✓	✓
GRI 402: Labor/Management Relations				
GRI 402-1 Minimum notice periods regarding operational changes	✓	×	✓	✓
GRI 403: Occupational Health and Safety				

Appendix C Criteria for estimation Sustainability Disclosure (Cont.)

Descriptive	Agricultural and Food Industry		Technology Industry	
	Food and Beverage	**Agricbusiness**	**Information technology and Communication**	**Electronic component**
GRI 403-1 Occupational health and safety management system	✓	✓	✓	✓
GRI 403-2 Hazard identification, risk assessment, and incident investigation	✓	✓	✓	✓
GRI 403-3 Occupational health services to temporary or part-time employees	✓	✓	✓	✓
GRI 403-4 Worker participation, consultation, and communication on occupational health and safety	✓	✓	✓	✓

Appendix C Criteria for estimation Sustainability Disclosure (Cont.)

Descriptive	Agricultural and Food Industry		Technology Industry	
	Food and Beverage	**Agricbusiness**	**Information technology and Communication**	**Electronic component**
GRI 403-5 Worker training on occupational health and safety	✓	✓	✓	✓
GRI 403-6 Promotion of worker health	✓	✓	✓	✓
GRI 403-7 Prevention and mitigation of occupational health and safety impacts directly linked by business relationships	✓	✓	✓	✓
GRI 403-8 Workers covered by an occupational health and safety management system	✓	✓	✓	✓
GRI 403-9 Work-related injuries	✓	✓	✓	✓
GRI 403-10 Work-related ill health	✓	✓	✓	✓
GRI 404: Training and Education				
GRI 404-1 Average hours of training per year per employee	✓	✓	✓	✓

Appendix C Criteria for estimation Sustainability Disclosure (Cont.)

Descriptive	Agricultural and Food Industry		Technology Industry	
	Food and Beverage	**Agricbusiness**	**Information technology and Communication**	**Electronic component**
GRI 404-2 Programs for upgrading employee skills and transition assistance programs	✓	✓	✓	✓
GRI 404-3 Percentage of employees receiving regular performance and career development reviews	✓	✓	✓	✓
GRI 405: Diversity and Equal Opportunity				
GRI 405-1 Diversity of governance bodies and employees	✓	✓	✓	✓
GRI 405-2 Ratio of basic salary and remuneration of women to men	✓	✓	✓	✓
GRI 406: Non-discrimination				

Appendix C Criteria for estimation Sustainability Disclosure (Cont.)

Descriptive	Agricultural and Food Industry		Technology Industry	
	Food and Beverage	**Agricbusiness**	**Information technology and Communication**	**Electronic component**
GRI 406-1 Incidents of discrimination and corrective actions taken	✓	✓	✓	✓
GRI 407: Freedom of Association and Collective Bargaining				
GRI 407-1 Operations and suppliers in which the right to freedom of association and collective bargaining may be at risk	✓	✓	✓	✓
GRI 408: Child Labor				
GRI 408-1 Operations and suppliers at significant risk for incidents of child labor	✓	✓	✓	✓
GRI 409: Forced or Compulsory Labor				
GRI 409-1 Operations and suppliers at significant risk for incidents of forced or compulsory labor	✓	✓	✓	✓

Appendix C Criteria for estimation Sustainability Disclosure (Cont.)

Descriptive	Agricultural and Food Industry		Technology Industry	
	Food and Beverage	**Agricbusiness**	**Information technology and Communication**	**Electronic component**
GRI 410: Security Practices				
GRI 410-1 Security personnel trained in human rights policies or procedures	✓	✓	×	✓
GRI 411: Rights of Indigenous Peoples				
GRI 411-1 Incidents of violations involving rights of indigenous peoples	✓	✓	✓	✓
GRI 412: Human Rights Assessment				
GRI 412-1 Operations that have been subject to human rights reviews or impact assessments	✓	✓	✓	✓
GRI 412-2 Employee training on human rights policies or procedures	✓	✓	✓	✓
GRI 412-3 Significant investment agreements and contracts that include	✓	✓	✓	✓

Appendix C Criteria for estimation Sustainability Disclosure (Cont.)

Descriptive	Agricultural and Food Industry		Technology Industry	
	Food and Beverage	**Agricbusiness**	**Information technology and Communication**	**Electronic component**
GRI 413: Local Communities				
GRI 413-1 Operations with local community engagement, impact assessments, and development programs	✓	✓	✓	✓
GRI 413-2 Operations with significant actual and potential negative impacts on local communities	✓	✓	✓	✓
GRI 414: Supplier Social Assessment				
GRI 414-1 New suppliers that were screened using social criteria	✓	✓	✓	✓
GRI 414-2 Negative social impacts in the supply chain and actions taken	✓	✓	✓	✓
GRI 415: Public Policy				

Appendix C Criteria for estimation Sustainability Disclosure (Cont.)

Descriptive	Agricultural and Food Industry		Technology Industry	
	Food and Beverage	**Agricbusiness**	**Information technology and Communication**	**Electronic component**
GRI 415-1 Political contributions	✓	✓	✓	✓
GRI 416: Customer Health and Safety				
GRI 416-1 Assessment of the health and safety impacts of product and service categories	✓	✓	✓	✓
GRI 416-2 Incidents of non-compliance concerning the health and safety impacts of products and services	✓	✓	✓	✓
GRI 417: Marketing and Labeling				
GRI 417-1 Requirements for product and service information and labeling	✓	✓	✓	✓
GRI 417-2 Incidents of non-compliance concerning product and service information and labeling	✓	✓	✓	✓

Appendix C Criteria for estimation Sustainability Disclosure (Cont.)

Descriptive	Agricultural and Food Industry		Technology Industry	
	Food and Beverage	**Agricbusiness**	**Information technology and Communication**	**Electronic component**
GRI 417-3 Incidents of non-compliance concerning marketing communications	✓	✓	✓	✓
GRI 418: Customer Privacy				
GRI 418-1 Substantiated complaints concerning breaches of customer privacy and losses of customer data	✓	✓	✓	✓
GRI 419: Socioeconomic Compliance	✓	✓	✓	✓
GRI 419-1 Non-compliance with laws and regulations in the social and economic area	✓	✓	✓	✓

Appendix C Criteria for estimation Sustainability Disclosure

Descriptive	Services Industry			
	Transportation and Logistics	**Media and Publishing**	**Professional Services**	**Tourisms & Leisure**
GRI 101: Foundation-Starting point for using the GRI Standards				
GRI 102: General Disclosures-To report contextual information about an organization	✓	✓	✓	✓
Organizational profile				
GRI 102-1 Name of the organization	✓	✓	✓	✓
GRI 102-2 Activities, brands, products, and services	✓	✓	✓	✓
GRI 102-3 Location of headquarters	✓	✓	✓	✓
GRI 102-4 Location of operations	✓	✓	✓	✓
GRI 102-5 Ownership and legal form	✓	✓	✓	✓
GRI 102-6 Markets served	✓	✓	✓	✓
GRI 102-7 Scale of the organization	✓	✓	✓	✓

Appendix C Criteria for estimation Sustainability Disclosure (Cont.)

Descriptive	Services Industry			
	Transportation and Logistics	**Media and Publishing**	**Professional Services**	**Tourisms & Leisure**
GRI 102-7 Scale of the organization	✓	✓	✓	✓
GRI 102-8 Information on employees and other workers	✓	✓	✓	✓
GRI 102-9 Supply chain	✓	✓	✓	✓
GRI 102-10 Significant changes to the organization and its supply chain	✓	✓	✓	✓
GRI 102-11 Precautionary Principle or approach	✓	✓	✓	✓
GRI 102-12 External initiatives	✓	✓	✓	✓
GRI 102-13 Membership of associations Strategy	✓	✓	✓	✓
GRI 102-14 Statement from senior decision-maker	✓	✓	✓	✓

Appendix C Criteria for estimation Sustainability Disclosure (Cont.)

Descriptive	Services Industry			
	Transportation and Logistics	**Media and Publishing**	**Professional Services**	**Tourisms & Leisure**
GRI 102-15 Key impacts, risks, and opportunities	✓	✓	✓	✓
Ethics and integrity				
GRI 102-16 Values, principles, standards, and norms of behavior	✓	✓	✓	✓
GRI 102-17 Mechanisms for advice and concerns about ethics	✓	✓	✓	✓
GRI 102-18 Governance structure	✓	✓	✓	✓
GRI 102-19 Delegating authority	✓	✓	✓	✓
GRI 102-20 Executive-level responsibility for economic, environmental, and social topics	✓	✓	✓	✓
GRI 102-21 Consulting stakeholders on economic, environmental, and social topics	✓	✓	✓	✓

Appendix C Criteria for estimation Sustainability Disclosure (Cont.)

Descriptive	Services Industry			
	Transportation and Logistics	**Media and Publishing**	**Professional Services**	**Tourisms & Leisure**
GRI 102-22 Composition of the highest governance body and its committees	✓	✓	✓	✓
GRI 102-23 Chair of the highest governance body	✓	✓	✓	✓
GRI 102-24 Nominating and selecting the highest governance body	✓	✓	✓	✓
GRI 102-25 Conflicts of interest	✓	✓	✓	✓
GRI 102-26 Role of highest governance body in setting purpose, values, and strategy	✓	✓	✓	✓
GRI 102-27 Collective knowledge of highest governance body	✓	✓	✓	✓

Appendix C Criteria for estimation Sustainability Disclosure (Cont.)

Descriptive	Services Industry			
	Transportation and Logistics	**Media and Publishing**	**Professional Services**	**Tourisms & Leisure**
GRI 102-28 Evaluating the highest governance body's performance	✓	✓	✓	✓
GRI 102-29 Identifying and managing economic, environmental, and social impacts	✓	✓	✓	✓
GRI 102-30 Effectiveness of risk management processes	✓	✓	✓	✓
GRI 102-31 Review of economic, environmental, and social topics	✓	✓	✓	✓
GRI 102-32 Highest governance body's role in sustainability reporting	✓	✓	✓	✓
GRI 102-33 Communicating critical concerns	✓	✓	✓	✓

Appendix C Criteria for estimation Sustainability Disclosure (Cont.)

Descriptive	Services Industry			
	Transportation and Logistics	**Media and Publishing**	**Professional Services**	**Tourisms & Leisure**
GRI 102-34 Nature and total number of critical concerns	✓	✓	✓	✓
GRI 102-35 Remuneration policies	✓	✓	✓	✓
GRI 102-36 Process for determining remuneration	✓	✓	✓	✓
GRI 102-37 Stakeholders' involvement in remuneration	✓	✓	✓	✓
GRI 102-38 Annual total compensation ratio	✓	✓	✓	✓
GRI 102-39 Percentage increase in annual total compensation ratio	✓	✓	✓	✓
Stakeholder engagement				
GRI 102-40 List of stakeholder groups	✓	✓	✓	✓

Appendix C Criteria for estimation Sustainability Disclosure (Cont.)

Descriptive	Services Industry			
	Transportation and Logistics	**Media and Publishing**	**Professional Services**	**Tourisms & Leisure**
GRI 102-41 Collective bargaining agreements	✓	✓	✓	✓
GRI 102-42 Identifying and selecting stakeholders	✓	✓	✓	✓
GRI 102-43 Approach to stakeholder engagement	✓	✓	✓	✓
GRI 102-44 Key topics and concerns raised	✓	✓	✓	✓
GRI 102-45 Entities included in the consolidated financial statements	✓	✓	✓	✓
GRI 102-46 Defining report content and topic Boundaries	✓	✓	✓	✓
GRI 102-47 List of material topics	✓	✓	✓	✓
GRI 102-48 Restatements of information	✓	✓	✓	✓

Appendix C Criteria for estimation Sustainability Disclosure (Cont.)

Descriptive	Services Industry			
	Transportation and Logistics	**Media and Publishing**	**Professional Services**	**Tourisms & Leisure**
GRI 102-49 Changes in reporting	✓	✓	✓	✓
GRI 102-50 Reporting period	✓	✓	✓	✓
GRI 102-51 Date of most recent report	✓	✓	✓	✓
GRI 102-52 Reporting cycle	✓	✓	✓	✓
GRI 102-53 Contact point for questions regarding the report	✓	✓	✓	✓
GRI 102-54 Claims of reporting in accordance with the GRI Standards	✓	✓	✓	✓
GRI 102-55 GRI content index	✓	✓	✓	✓
GRI 102-56 External assurance	✓	✓	✓	✓
GRI 103: Management Approach-To report the management approach for each material topic				

Appendix C Criteria for estimation Sustainability Disclosure (Cont.)

Descriptive	Services Industry			
	Transportation and Logistics	**Media and Publishing**	**Professional Services**	**Tourisms & Leisure**
GRI 103-1 Explanation of the material topic and its Boundary	✓	✓	✓	✓
GRI 103-2 The management approach and its components	✓	✓	✓	✓
GRI 103-3 Evaluation of the management approach	✓	✓	✓	✓
GRI 201: Economic Performance				
GRI 201-1 Direct economic value generated and distributed	✓	✓	✓	✓
GRI 201-2 Financial implications and other risks and opportunities due to climate change	✓	✓	✓	✓
GRI 201-3 Defined benefit plan obligations and other retirement plans	✓	✓	✓	✓
GRI 201-4 Financial assistance received from government	✓	✓	✓	✓

Appendix C Criteria for estimation Sustainability Disclosure (Cont.)

Descriptive	Services Industry			
	Transportation and Logistics	**Media and Publishing**	**Professional Services**	**Tourisms & Leisure**
GRI 202: Market Presence				
GRI 202-1 Ratios of standard entry level wage by gender compared to local minimum wage	×	✓	×	×
GRI 202-2 Proportion of senior management hired from the local community	×	✓	×	×
GRI 203: Indirect Economic Impacts				
GRI 203-1 Infrastructure investments and services supported	✓	✓	✓	✓
GRI 203-2 Significant indirect economic impacts	✓	✓	✓	✓
GRI 204: Procurement Practices				
GRI 204-1 Proportion of spending on local suppliers	✓	✓	✓	✓

Appendix C Criteria for estimation Sustainability Disclosure (Cont.)

Descriptive	Services Industry			
	Transportation and Logistics	**Media and Publishing**	**Professional Services**	**Tourisms & Leisure**
GRI 205: Anti-corruption				
GRI 205-1 Operations assessed for risks related to corruption	✓	✓	✓	✓
GRI 205-2 Communication and training about anti-corruption policies and procedures	✓	✓	✓	✓
GRI 205-3 Confirmed incidents of corruption and actions taken	✓	✓	✓	✓
GRI 206: Anti-competitive Behavior				
GRI 206-1 Legal actions for anti-competitive behavior, anti-trust, and monopoly practices	✓	✓	✓	✓
GRI 301: Materials				
GRI 301-1 Materials used by weight or volume	✓	✓	✓	✓
GRI 301-2 Recycled input materials used	✓	✓	✓	✓
GRI 301-3 Reclaimed products and their packaging materials	✓	✓	✓	✓

Appendix C Criteria for estimation Sustainability Disclosure (Cont.)

Descriptive	Services Industry			
	Transportation and Logistics	**Media and Publishing**	**Professional Services**	**Tourisms & Leisure**
GRI 302: Energy				
GRI 302-1 Energy consumption within the organization	✓	✓	✓	✓
GRI 302-2 Energy consumption outside of the organization	✓	✓	✓	✓
GRI 302-3 Energy intensity	✓	✓	✓	✓
GRI 302-4 Reduction of energy consumption	✓	✓	✓	✓
GRI 302-5 Reductions in energy requirements of products and services	✓	✓	✓	✓
GRI 303: Water and Effluents				
GRI 303-1 Interactions with water as a shared resource	✓	✓	✓	✓
GRI 303-2 Management of water discharge-related impacts	✓	✓	✓	✓

Appendix C Criteria for estimation Sustainability Disclosure (Cont.)

Descriptive	Services Industry			
	Transportation and Logistics	**Media and Publishing**	**Professional Services**	**Tourisms & Leisure**
GRI 303-3 Water withdrawal	✓	✓	✓	✓
GRI 303-4 Water discharge	✓	✓	✓	✓
GRI 303-5 Water consumption	✓	✓	✓	✓
GRI 304: Biodiversity				
GRI 304-1 Operational sites owned, leased, managed in, or adjacent to, protected areas and areas of high biodiversity value outside protected areas	✓	✓	✓	✓
GRI 304-2 Significant impacts of activities, products, and services on biodiversity	✓	✓	✓	✓
GRI 304-3 Habitats protected or restored	✓	✓	✓	✓
GRI 304-4 IUCN Red List species and national conservation list species with habitats in areas affected by operations	✓	✓	✓	✓

Appendix C Criteria for estimation Sustainability Disclosure (Cont.)

Descriptive	Services Industry			
	Transportation and Logistics	**Media and Publishing**	**Professional Services**	**Tourisms & Leisure**
GRI 305: Emissions				
GRI 305-1 Direct (Scope 1) GHG emissions	✓	✓	✓	✓
GRI 305-2 Energy indirect (Scope 2) GHG emissions	✓	✓	✓	✓
GRI 305-3 Other indirect (Scope 3) GHG emissions	✓	✓	✓	✓
GRI 305-4 GHG emissions intensity	✓	✓	✓	✓
GRI 305-5 Reduction of GHG emissions	✓	✓	✓	✓
GRI 305-6 Emissions of ozone-depleting substances (ODS)	✓	✓	✓	✓
GRI 305-7 Nitrogen oxides (NOX), sulfur oxides (SOX), and other significant air emissions	✓	✓	✓	✓
GRI 306: Effluents and Waste				

Appendix C Criteria for estimation Sustainability Disclosure (Cont.)

Descriptive	Services Industry			
	Transportation and Logistics	**Media and Publishing**	**Professional Services**	**Tourisms & Leisure**
GRI 306-1 Water discharge by quality and destination	✓	✓	✓	✓
GRI 306-2 Waste by type and disposal method	✓	✓	✓	✓
GRI 306-3 Significant spills	✓	✓	✓	✓
GRI 306-4 Transport of hazardous waste	✓	✓	✓	✓
GRI 306-5 Water bodies affected by water discharges and/or runoff	✓	✓	✓	✓
GRI 307: Environmental Compliance				
GRI 307-1 Non-compliance with environmental laws and regulations	✓	✓	✓	✓
GRI 308: Supplier Environmental Assessment				
GRI 308-1 New suppliers that were screened using environmental criteria	✓	✓	✓	✓

Appendix C Criteria for estimation Sustainability Disclosure (Cont.)

Descriptive	Services Industry			
	Transportation and Logistics	**Media and Publishing**	**Professional Services**	**Tourisms & Leisure**
GRI 308-2 Negative environmental impacts in the supply chain and actions taken	✓	✓	✓	✓
GRI 401: Employment				
GRI 401-1 New employee hires and employee turnover	✓	✓	✓	✓
GRI 401-2 Benefits provided to full-time employees that are not provided to temporary or part-time employees	✓	✓	✓	✓
GRI 401-3 Parental leave	✓	✓	✓	✓
GRI 402: Labor/Management Relations				
GRI 402-1 Minimum notice periods regarding operational changes	×	✓	×	×
GRI 403: Occupational Health and Safety				

Appendix C Criteria for estimation Sustainability Disclosure (Cont.)

Descriptive	Services Industry			
	Transportation and Logistics	**Media and Publishing**	**Professional Services**	**Tourisms & Leisure**
GRI 403-1 Occupational health and safety management system	✓	✓	✓	✓
GRI 403-2 Hazard identification, risk assessment, and incident investigation	✓	✓	✓	✓
GRI 403-3 Occupational health services to temporary or part-time employees	✓	✓	✓	✓
GRI 403-4 Worker participation, consultation, and communication on occupational health and safety	✓	✓	✓	✓

Appendix C Criteria for estimation Sustainability Disclosure (Cont.)

Descriptive	Services Industry			
	Transportation and Logistics	**Media and Publishing**	**Professional Services**	**Tourisms & Leisure**
GRI 403-5 Worker training on occupational health and safety	✓	✓	✓	✓
GRI 403-6 Promotion of worker health	✓	✓	✓	✓
GRI 403-7 Prevention and mitigation of occupational health and safety impacts directly linked by business relationships	✓	✓	✓	✓
GRI 403-8 Workers covered by an occupational health and safety management system	✓	✓	✓	✓
GRI 403-9 Work-related injuries	✓	✓	✓	✓
GRI 403-10 Work-related ill health	✓	✓	✓	✓
GRI 404: Training and Education				
GRI 404-1 Average hours of training per year per employee	✓	✓	✓	✓

Appendix C Criteria for estimation Sustainability Disclosure (Cont.)

Descriptive	Services Industry			
	Transportation and Logistics	**Media and Publishing**	**Professional Services**	**Tourisms & Leisure**
GRI 404-2 Programs for upgrading employee skills and transition assistance programs	✓	✓	✓	✓
GRI 404-3 Percentage of employees receiving regular performance and career development reviews	✓	✓	✓	✓
GRI 405: Diversity and Equal Opportunity				
GRI 405-1 Diversity of governance bodies and employees	✓	✓	✓	✓
GRI 405-2 Ratio of basic salary and remuneration of women to men	✓	✓	✓	✓
GRI 406: Non-discrimination				

Appendix C Criteria for estimation Sustainability Disclosure (Cont.)

Descriptive	Services Industry			
	Transportation and Logistics	**Media and Publishing**	**Professional Services**	**Tourisms & Leisure**
GRI 406-1 Incidents of discrimination and corrective actions taken	✓	✓	✓	✓
GRI 407: Freedom of Association and Collective Bargaining				
GRI 407-1 Operations and suppliers in which the right to freedom of association and collective bargaining may be at risk	✓	✓	✓	✓
GRI 408: Child Labor				
GRI 408-1 Operations and suppliers at significant risk for incidents of child labor	✓	✓	✓	✓
GRI 409: Forced or Compulsory Labor				
GRI 409-1 Operations and suppliers at significant risk for incidents of forced or compulsory labor	✓	✓	✓	✓

Appendix C Criteria for estimation Sustainability Disclosure (Cont.)

Descriptive	Services Industry			
	Transportation and Logistics	**Media and Publishing**	**Professional Services**	**Tourisms & Leisure**
GRI 410: Security Practices				
GRI 410-1 Security personnel trained in human rights policies or procedures	✓	✓	×	×
GRI 411: Rights of Indigenous Peoples				
GRI 411-1 Incidents of violations involving rights of indigenous peoples	✓	✓	✓	✓
GRI 412: Human Rights Assessment				
GRI 412-1 Operations that have been subject to human rights reviews or impact assessments	✓	✓	✓	✓
GRI 412-2 Employee training on human rights policies or procedures	✓	✓	✓	✓
GRI 412-3 Significant investment agreements and contracts that include	✓	✓	✓	✓

Appendix C Criteria for estimation Sustainability Disclosure (Cont.)

Descriptive	Services Industry			
	Transportation and Logistics	**Media and Publishing**	**Professional Services**	**Tourisms & Leisure**
GRI 413: Local Communities				
GRI 413-1 Operations with local community engagement, impact assessments, and development programs	✓	✓	✓	✓
GRI 413-2 Operations with significant actual and potential negative impacts on local communities	✓	✓	✓	✓
GRI 414: Supplier Social Assessment				
GRI 414-1 New suppliers that were screened using social criteria	✓	✓	✓	✓
GRI 414-2 Negative social impacts in the supply chain and actions taken	✓	✓	✓	✓
GRI 415: Public Policy				

Appendix C Criteria for estimation Sustainability Disclosure (Cont.)

Descriptive	Services Industry			
	Transportation and Logistics	**Media and Publishing**	**Professional Services**	**Tourisms & Leisure**
GRI 415-1 Political contributions	✓	✓	✓	✓
GRI 416: Customer Health and Safety				
GRI 416-1 Assessment of the health and safety impacts of product and service categories	✓	✓	✓	✓
GRI 416-2 Incidents of non-compliance concerning the health and safety impacts of products and services	✓	✓	✓	✓
GRI 417: Marketing and Labeling				
GRI 417-1 Requirements for product and service information and labeling	✓	✓	✓	✓
GRI 417-2 Incidents of non-compliance concerning product and service information and labeling	✓	✓	✓	✓

Appendix C Criteria for estimation Sustainability Disclosure (Cont.)

Descriptive	Services Industry			
	Transportation and Logistics	**Media and Publishing**	**Professional Services**	**Tourisms & Leisure**
GRI 417-3 Incidents of non-compliance concerning marketing communications	✓	✓	✓	✓
GRI 418: Customer Privacy				
GRI 418-1 Substantiated complaints concerning breaches of customer privacy and losses of customer data	✓	✓	✓	✓
GRI 419: Socioeconomic Compliance	✓	✓	✓	✓
GRI 419-1 Non-compliance with laws and regulations in the social and economic area	✓	✓	✓	✓

Appendix C Criteria for estimation Sustainability Disclosure

Descriptive	Services Industry	
	Commerce	**Health Care Services**
GRI 101: Foundation-Starting point for using the GRI Standards		
GRI 102: General Disclosures-To report contextual information about an organization	✓	✓
Organizational profile		
GRI 102-1 Name of the organization	✓	✓
GRI 102-2 Activities, brands, products, and services	✓	✓
GRI 102-3 Location of headquarters	✓	✓
GRI 102-4 Location of operations	✓	✓
GRI 102-5 Ownership and legal form	✓	✓
GRI 102-6 Markets served	✓	✓
GRI 102-7 Scale of the organization	✓	✓
GRI 102-8 Information on employees and other workers	✓	✓
GRI 102-9 Supply chain	✓	✓
GRI 102-10 Significant changes to the organization and its supply chain	✓	✓
GRI 102-11 Precautionary Principle or approach	✓	✓
GRI 102-12 External initiatives	✓	✓
GRI 102-13 Membership of associations	✓	✓

Appendix C Criteria for estimation Sustainability Disclosure (Cont.)

Descriptive	Services Industry	
	Commerce	**Health Care Services**
Strategy		
GRI 102-14 Statement from senior decision-maker	✓	✓
GRI 102-15 Key impacts, risks, and opportunities	✓	✓
Ethics and integrity		
GRI 102-16 Values, principles, standards, and norms of behavior	✓	✓
GRI 102-17 Mechanisms for advice and concerns about ethics	✓	✓
GRI 102-18 Governance structure	✓	✓
GRI 102-19 Delegating authority	✓	✓
GRI 102-20 Executive-level responsibility for economic, environmental, and social topics	✓	✓
GRI 102-21 Consulting stakeholders on economic, environmental, and social topics	✓	✓
GRI 102-22 Composition of the highest governance body and its committees	✓	✓
GRI 102-23 Chair of the highest governance body	✓	✓
GRI 102-24 Nominating and selecting the highest governance body	✓	✓

Appendix C Criteria for estimation Sustainability Disclosure (Cont.)

Descriptive	Services Industry	
	Commerce	**Health Care Services**
GRI 102-25 Conflicts of interest	✓	✓
GRI 102-26 Role of highest governance body in setting purpose, values, and strategy	✓	✓
GRI 102-27 Collective knowledge of highest governance body	✓	✓
GRI 102-25 Conflicts of interest	✓	✓
GRI 102-26 Role of highest governance body in setting purpose, values, and strategy	✓	✓
GRI 102-27 Collective knowledge of highest governance body	✓	✓
GRI 102-28 Evaluating the highest governance body's performance	✓	✓
GRI 102-29 Identifying and managing economic, environmental, and social impacts	✓	✓
GRI 102-30 Effectiveness of risk management processes	✓	✓
GRI 102-31 Review of economic, environmental, and social topics	✓	✓
GRI 102-32 Highest governance body's role in sustainability reporting	✓	✓

Appendix C Criteria for estimation Sustainability Disclosure (Cont.)

Descriptive	Services Industry	
	Commerce	**Health Care Services**
GRI 102-33 Communicating critical concerns	✓	✓
GRI 102-34 Nature and total number of critical concerns	✓	✓
GRI 102-35 Remuneration policies	✓	✓
GRI 102-36 Process for determining remuneration	✓	✓
GRI 102-37 Stakeholders' involvement in remuneration	✓	✓
GRI 102-38 Annual total compensation ratio	✓	✓
GRI 102-39 Percentage increase in annual total compensation ratio	✓	✓
Stakeholder engagement		
GRI 102-40 List of stakeholder groups	✓	✓
GRI 102-41 Collective bargaining agreements	✓	✓
GRI 102-42 Identifying and selecting stakeholders	✓	✓
GRI 102-43 Approach to stakeholder engagement	✓	✓
GRI 102-44 Key topics and concerns raised	✓	✓

Appendix C Criteria for estimation Sustainability Disclosure (Cont.)

Descriptive	Services Industry	
	Commerce	**Health Care Services**
GRI 102-45 Entities included in the consolidated financial statements	✓	✓
GRI 102-46 Defining report content and topic Boundaries	✓	✓
GRI 102-47 List of material topics	✓	✓
GRI 102-48 Restatements of information	✓	✓
GRI 102-49 Changes in reporting	✓	✓
GRI 102-50 Reporting period	✓	✓
GRI 102-51 Date of most recent report	✓	✓
GRI 102-52 Reporting cycle	✓	✓
GRI 102-53 Contact point for questions regarding the report	✓	✓
GRI 102-54 Claims of reporting in accordance with the GRI Standards	✓	✓
GRI 102-55 GRI content index	✓	✓
GRI 102-56 External assurance	✓	✓
GRI 103: Management Approach-To report the management approach for each material topic		
GRI 103-1 Explanation of the material topic and its Boundary	✓	✓
GRI 103-2 The management approach and its components	✓	✓

Appendix C Criteria for estimation Sustainability Disclosure (Cont.)

Descriptive	Services Industry	
	Commerce	**Health Care Services**
GRI 103-3 Evaluation of the management approach	✓	✓
GRI 201: Economic Performance		
GRI 201-1 Direct economic value generated and distributed	✓	✓
GRI 201-2 Financial implications and other risks and opportunities due to climate change	✓	✓
GRI 201-3 Defined benefit plan obligations and other retirement plans	✓	✓
GRI 201-4 Financial assistance received from government	✓	✓
GRI 202: Market Presence		
GRI 202-1 Ratios of standard entry level wage by gender compared to local minimum wage	×	×
GRI 202-2 Proportion of senior management hired from the local community	×	×
GRI 203: Indirect Economic Impacts		
GRI 203-1 Infrastructure investments and services supported	✓	✓
GRI 203-2 Significant indirect economic impacts	✓	✓

Appendix C Criteria for estimation Sustainability Disclosure (Cont.)

Descriptive	Services Industry	
	Commerce	**Health Care Services**
GRI 204: Procurement Practices		
GRI 204-1 Proportion of spending on local suppliers	✓	✓
GRI 205: Anti-corruption		
GRI 205-1 Operations assessed for risks related to corruption	✓	✓
GRI 205-2 Communication and training about anti-corruption policies and procedures	✓	✓
GRI 205-3 Confirmed incidents of corruption and actions taken	✓	✓
GRI 206: Anti-competitive Behavior		
GRI 206-1 Legal actions for anti-competitive behavior, anti-trust, and monopoly practices	✓	✓
GRI 301: Materials		
GRI 301-1 Materials used by weight or volume	✓	✓
GRI 301-2 Recycled input materials used	✓	✓
GRI 301-3 Reclaimed products and their packaging materials	✓	✓

Appendix C Criteria for estimation Sustainability Disclosure (Cont.)

Descriptive	Services Industry	
	Commerce	**Health Care Services**
GRI 302: Energy		
GRI 302-1 Energy consumption within the organization	✓	✓
GRI 302-2 Energy consumption outside of the organization	✓	✓
GRI 302-3 Energy intensity	✓	✓
GRI 302-4 Reduction of energy consumption	✓	✓
GRI 302-5 Reductions in energy requirements of products and services	✓	✓
GRI 303: Water and Effluents		
GRI 303-1 Interactions with water as a shared resource	✓	✓
GRI 303-2 Management of water discharge-related impacts	✓	✓
GRI 303-3 Water withdrawal	✓	✓
GRI 303-4 Water discharge	✓	✓
GRI 303-5 Water consumption	✓	✓
GRI 304: Biodiversity		
GRI 304-1 Operational sites owned, leased, managed in, or adjacent to, protected areas and areas of high biodiversity value outside protected areas	✓	✓

Appendix C Criteria for estimation Sustainability Disclosure (Cont.)

Descriptive	Services Industry	
	Commerce	Health Care Services
GRI 304-2 Significant impacts of activities, products, and services on biodiversity	✓	✓
GRI 304-3 Habitats protected or restored	✓	✓
GRI 304-4 IUCN Red List species and national conservation list species with habitats in areas affected by operations	✓	✓
GRI 305: Emissions		
GRI 305-1 Direct (Scope 1) GHG emissions	✓	✓
GRI 305-2 Energy indirect (Scope 2) GHG emissions	✓	✓
GRI 305-3 Other indirect (Scope 3) GHG emissions	✓	✓
GRI 305-4 GHG emissions intensity	✓	✓
GRI 305-5 Reduction of GHG emissions	✓	✓
GRI 305-6 Emissions of ozone-depleting substances (ODS)	✓	✓
GRI 305-7 Nitrogen oxides (NOX), sulfur oxides (SOX), and other significant air emissions	✓	✓

Appendix C Criteria for estimation Sustainability Disclosure (Cont.)

Descriptive	Services Industry	
	Commerce	**Health Care Services**
GRI 306: Effluents and Waste		
GRI 306-1 Water discharge by quality and destination	✓	✓
GRI 306-2 Waste by type and disposal method	✓	✓
GRI 306-3 Significant spills	✓	✓
GRI 306-4 Transport of hazardous waste	✓	✓
GRI 306-5 Water bodies affected by water discharges and/or runoff	✓	✓
GRI 307: Environmental Compliance		
GRI 307-1 Non-compliance with environmental laws and regulations	✓	✓
GRI 308: Supplier Environmental Assessment		
GRI 308-1 New suppliers that were screened using environmental criteria	✓	✓
GRI 308-2 Negative environmental impacts in the supply chain and actions taken	✓	✓
GRI 401: Employment		
GRI 401-1 New employee hires and employee turnover	✓	✓
GRI 401-2 Benefits provided to full-time employees that are not provided to temporary or part-time employees	✓	✓

Appendix C Criteria for estimation Sustainability Disclosure (Cont.)

Descriptive	Services Industry	
	Commerce	Health Care Services
GRI 402: Labor/Management Relations		
GRI 402-1 Minimum notice periods regarding operational changes	×	×
GRI 403: Occupational Health and Safety		
GRI 403-1 Occupational health and safety management system	✓	✓
GRI 403-2 Hazard identification, risk assessment, and incident investigation	✓	✓
GRI 403-3 Occupational health services to temporary or part-time employees	✓	✓
GRI 403-4 Worker participation, consultation, and communication on occupational health and safety	✓	✓
GRI 403-5 Worker training on occupational health and safety	✓	✓
GRI 403-6 Promotion of worker health	✓	✓
GRI 403-7 Prevention and mitigation of occupational health and safety impacts directly linked by business relationships	✓	✓
GRI 403-8 Workers covered by an occupational health and safety management system	✓	✓
GRI 403-9 Work-related injuries	✓	✓
GRI 403-10 Work-related ill health	✓	✓

Appendix C Criteria for estimation Sustainability Disclosure (Cont.)

Descriptive	Services Industry	
	Commerce	Health Care Services
GRI 404: Training and Education		
GRI 404-1 Average hours of training per year per employee	✓	✓
GRI 404-2 Programs for upgrading employee skills and transition assistance programs	✓	✓
GRI 404-3 Percentage of employees receiving regular performance and career development reviews	✓	✓
GRI 405: Diversity and Equal Opportunity		
GRI 405-1 Diversity of governance bodies and employees	✓	✓
GRI 405-2 Ratio of basic salary and remuneration of women to men	✓	✓
GRI 406: Non-discrimination		
GRI 406-1 Incidents of discrimination and corrective actions taken	✓	✓
GRI 407: Freedom of Association and Collective Bargaining		
GRI 407-1 Operations and suppliers in which the right to freedom of association and collective bargaining may be at risk	✓	✓
GRI 408: Child Labor		
GRI 408-1 Operations and suppliers at significant risk for incidents of child labor	✓	✓

Appendix C Criteria for estimation Sustainability Disclosure (Cont.)

Descriptive	Services Industry	
	Commerce	Health Care Services
GRI 409: Forced or Compulsory Labor		
GRI 409-1 Operations and suppliers at significant risk for incidents of forced or compulsory labor	✓	✓
GRI 410: Security Practices		
GRI 410-1 Security personnel trained in human rights policies or procedures	✓	×
GRI 411: Rights of Indigenous Peoples		
GRI 411-1 Incidents of violations involving rights of indigenous peoples	✓	✓
GRI 412: Human Rights Assessment		
GRI 412-1 Operations that have been subject to human rights reviews or impact assessments	✓	✓
GRI 412-2 Employee training on human rights policies or procedures	✓	✓
GRI 412-3 Significant investment agreements and contracts that include	✓	✓
GRI 413: Local Communities		
GRI 413-1 Operations with local community engagement, impact assessments, and development programs	✓	✓
GRI 413-2 Operations with significant actual and potential negative impacts on local communities	✓	✓

Appendix C Criteria for estimation Sustainability Disclosure (Cont.)

Descriptive	Services Industry	
	Commerce	Health Care Services
GRI 414: Supplier Social Assessment		
GRI 414-1 New suppliers that were screened using social criteria	✓	✓
GRI 414-2 Negative social impacts in the supply chain and actions taken	✓	✓
GRI 415: Public Policy		
GRI 415-1 Political contributions	✓	✓
GRI 416: Customer Health and Safety		
GRI 416-1 Assessment of the health and safety impacts of product and service categories	✓	✓
GRI 416-2 Incidents of non-compliance concerning the health and safety impacts of products and services	✓	✓
GRI 417: Marketing and Labeling		
GRI 417-1 Requirements for product and service information and labeling	✓	✓
GRI 417-2 Incidents of non-compliance concerning product and service information and labeling	✓	✓
GRI 417-3 Incidents of non-compliance concerning marketing communications	✓	✓
GRI 418: Customer Privacy		
GRI 418-1 Substantiated complaints concerning breaches of customer privacy and losses of customer data	✓	✓

Appendix C Criteria for estimation Sustainability Disclosure (Cont.)

Descriptive	Services Industry	
	Commerce	**Health Care Services**
GRI 419: Socioeconomic Compliance		
GRI 419-1 Non-compliance with laws and regulations in the social and economic area	✓	✓

Biography

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