ANALYSIS OF MEDIATING EFFECT OF INTELLECTUAL CAPITAL EFFICIENCY LINKING BOARD OF DIRECTOR' CHARACTERISTICS AND FIRM PERFORMANCE: EMPIRICAL EVIDENCE FROM THAI LISTED COMPANIES

THANAPIN ATTARIT

A DISSERTATION SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF DOCTOR OF PHILOSOPHY PROGRAM IN BUSINESS ADMINISTRATION
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Program	Business Administration
Dissertation Advisor	Assistant Professor Kusuma Dampitakse, Ph.D.
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Academic Years	2016

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ABSTRACT

This study aimed to investigate the mediating effects of intellectual capital efficiency linking board of directors' characteristics and firm performance. The board of directors' characteristics consisted of the number of board of directors, the number of audit committee directors, the proportion of independent directors, the proportion of women sitting as board of directors, the frequency of board meetings, the frequency of audit committee meetings and the number of firms with separate chairman and CEO. Intellectual capital efficiency has been estimated using Value Added Intellectual Capital (VAIC) methodology. The samples used in this study were Thai listed non-financial companies in 2014. The data were analyzed by using Structural Equation Modeling (SEM) to determine the model test.

The results of this study revealed that the number of board of directors and the frequency of audit committee meetings had positive effect on the intellectual capital efficiency. Moreover, the proportion of women sitting as board of directors and the frequency of audit committee meetings had positive effect on the firms' performance. Apart from this, the intellectual capital efficiency had full mediating effect on the number of board of directors and firm performance. In addition, the intellectual capital efficiency had partial mediating effect on the frequency of audit committee meetings and firm performance. However no influence revealed on the number of audit committees, and firm with separate chairman and CEO in relation with the firm performance through the intellectual capital efficiency.

The findings of this study are important to regulators, investors, academics, and others who have contention that the board of directors' characteristics and firm performance are important for increasing intellectual capital efficiency. In the stock exchange, with the numbers of recent regulations focusing on corporate governance, there is a widely held view that better corporate governance is associated with better firm performance, and thus, increase intellectual capital efficiency.

Keywords: board of directors' characteristics, intellectual capital efficiency, firm performance

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CHAPTER 1
INTRODUCTION

1.1 Background and Statement of the Problem

In the 21st century, constant modernization, digital and communication technologies, complex types of incorporation, and intangible aspects are what distinguish business. Intellectual capital is accepted as an important part of a company's value, creating practices for firms functioning in competitive markets worldwide (Li, Pike, & Haniffa, 2008). Developing viable advantage and generating substantial shareholder value are the effects of such capital (Tayles, Pike, & Sofian, 2007). Greater investments in intangibles like employees, computer systems, research and development (R&D), and marketing offer proof of this fact (Orens, Aerts, & Lybaert, 2009). Attention to intellectual capital has increased within academic and practitioner communities as a result.

Concerning quota-free WTO settings, business settings are increasingly competitive. Consequently, organizations must deal with new trials for the improvement of performance to stay viable. Corporate governance is acknowledged as a tool for attaining the most effectiveness in such circumstances. For sustainability, efficiency, and prosperity to counter the recent challenges of quota-free settings worldwide, governance has a key role. By achieving the most out of its academic advantages and regarding corporate knowledge as one of the most permanent sources of competitive benefit in global business, any test can handle through corporate governance in this century of information (Makki & Lodhi, 2014).

Obtaining the most out of intellectual capital is the greatest test confronted by a firm in the century of knowledge. One of the most continuous sources of viable advantages in business is corporate knowledge. To exploit value formation, a firm needs a pattern change from the manufacturing era to a knowledge economy. The administration of knowledge, organizational methods, specialized skill, customer relationships and experience, and intellectual capital influences a contemporary firm to enhance its competitive benefits as a consequence. Through creation of a knowledge

base and converting it into efficacy, a firm can improve and preserve productivity (Nimtrakoon, 2014).

To determine the corporate authority tool, the Stock Exchange of Thailand has continuously encouraged (SET, 2012). In order to be equivalent to international standards, which helps the companies, the capital market, and the continuous development of the Thai economy, it additionally supposes that the boards and management teams of all listed companies will develop systems. In 2012, principles were amended to match with ASEAN Corporate Governance Scorecard criteria as a result, which are employed to evaluate and grade listed companies' corporate governance performance in ASEAN. This brings them up-to-date information again, raises the principles to an elevated level, and aids listed companies within the Kingdom to prepare for competition in ASEAN. For listed companies, the principles of effective corporate governance are grouped into two parts, comprising the actual principles and the suggested best practices. Nevertheless, this article fails to include the issues regarding corporate governance that were previously particular in the laws and regulations. The principles suggested good practices are offered in five kinds consisting of (1) rights of shareholders, (2) equitable treatment of shareholder, (3) role of stakeholders, (4) disclosure and transparency, and (5) responsibilities of the board.

In corporate governance, the board of directors has a very important role in the best achievement by the firm. Unrelated to management, the board is held to be responsible for its shareholders. However, decreased shareholders' wealth and corporate failure have usually been blamed on the board of directors. Various fraud cases such as Enron and WorldCom that resulted in the collapse of main corporations have been highlighted (Abidin, Kamal, & Jusoff, 2014). Examples for these corporate disappointments are the absence of ready oversight works by the board structure, the councils to corporate chiefs who seek after their own self-interests, and the board being delinquent in its responsibility to partners. Therefore, different corporate administration changes have particularly stressed suitable changes to be made to the top managerial staff as far as synthesis, structure, and proprietorship are setup. When making choices for the best interests of the company and all shareholders, the Stock Exchange of Thailand says that the board must possess leadership, vision, and sovereignty (SET,

2012). The board ought to unmistakably isolate its parts and obligations from those of administration and screen the organization's operations to guarantee all exercises are led as per the law and moral gauges. The structure of the board shall comprise executives with different capabilities, which are abilities, experience, and skill that are helpful to the organization. Executives should focus on their obligations and put every one of their endeavors to make a solid board. The chief's selection procedure should also be straightforward with no impact on controlling shareholders or administration and valid to outsiders.

Intellectual capital is thought to be vital to the competitiveness of the firms in a knowledge economy, no matter what industry. Corporate intellectual capital has a positive impact on market value and financial performance, as proposed by Chen, Cheng, and Hwang (2005). Meanwhile, Murale, Jayaraj, and Ashrafali (2010) suggested that an important and positive link between market value and book value is the corporate intellectual capital of an organization. Intellectual capital has turned out to be a basic key elusive resource which can change a national organization international, multinational, and transnational corporate powerhouse. The administration's area assumes an essential part in the development of economies around the world and its partake in general total national output of a nation rises quickly than its creation division, so in this way educated capital estimation and administration turn out to be critical.

This review looked at an aspect frequently disregarded in corporate administration and intellectual capital field, particularly an obligation of the top managerial staff qualities in creating intellectual capital and accomplishing most extreme effectiveness from intellectual capital assets to increase higher firm execution. It endeavors to evaluate the model of auxiliary relations among corporate administration measures, intellectual capital, and firm execution. The effect of intellectual capital on top managerial staff and firm execution of recorded organizations in the Stock Exchange of Thailand is utilized by auxiliary condition modeling. The characteristics of boards of director (board size, audit committee size, independent directors, and women on the board as well as board meetings, audit committee meetings, and CEO duality) have been reviewed. Using the extended VAIC^{TM} (Pulic, 2000) measurement and firm

performance represented by return on equity (ROE), the intellectual capital competence has been determined. All factors have been gathered with SETSMART, which is the yearly report of SET-listed companies. By assessing the first-ever structural model connecting board of directors, intellectual capital, and firm performance, the study added to the literature and also showed that intellectual capital links board of director traits and firm accomplishment.

1.2 Objectives of the Study

The main objectives of this study were to investigate the effect of intellectual capital efficiency linking board of director characteristics and firm performance concentrating on empirical evidence from Thai listed companies which were classified as follows:

1.2.1 To investigate the effect of the seven characteristics of board of director characteristics (the size of board of directors, the size of audit committees, the proportion of independent directors, the proportion of women on board, the frequency of board meetings, the frequency of audit committee meetings, and the firm with a separate chairman and CEO) on intellectual capital efficiency of listed companies on the Stock Exchange of Thailand.

1.2.2 To investigate the effect of the seven characteristics of board of directors (the size of board of directors, the size of audit committees, the proportion of independent directors, the proportion of women on board, the frequency of board meetings, the frequency of audit committee meetings, and the firm with a separate chairman and CEO) on firm performance of listed companies on the Stock Exchange of Thailand.

1.2.3 To investigate the effect of intellectual capital efficiency on firm performance of listed companies on the Stock Exchange of Thailand.

1.2.4 To investigate the effect of intellectual capital efficiency linking board of director characteristics and firm performance of listed companies on the Stock Exchange of Thailand.

1.3 Research Questions

The key question of this study was how board of directors efficiency has an impact on firm performance though intellectual capital efficiency. Also, the specific research questions were as follows:

1.3.1 Are there any direct effects of board of director characteristics on intellectual capital efficiency of listed companies on the Stock Exchange of Thailand?

1.3.2 Are there any direct effects of board of director characteristics on firm performance of listed companies on the Stock Exchange of Thailand?

1.3.3 Are there any direct effects of intellectual capital efficiency on firm performance of listed companies on the Stock Exchange of Thailand**?**

1.3.4 Is there any effect of board of director characteristics on firm performance through intellectual capital efficiency of listed companies on the Stock Exchange of Thailand?

1.4 Research Hypotheses

In this study, board of director characteristics impact firm performance though intellectual capital efficiency which was explained by the agency theory (Tajfel, 2010). Thus, the four hypotheses were conducted based on the concept as shown in the following:

Research Hypothesis 1: The board of director characteristics has a positive effect on intellectual capital efficiency of listed companies on the Stock Exchange of Thailand.

H1a: The size of board of directors has a positive effect on intellectual capital efficiency.

H1b: The size of audit committees has a positive effect on intellectual capital efficiency.

H1c: The proportion of independent directors has a positive effect on intellectual capital efficiency.

H1d: The proportion of women on boards has a positive effect on intellectual capital efficiency.

H1e: The frequency of board meetings has a positive effect on intellectual capital efficiency.

H1f: The frequency of audit committee meetings has a positive effect on intellectual capital efficiency.

H1g: The firm with a separate chairman and CEO has a positive effect on intellectual capital efficiency.

Research Hypothesis 2: The board of director characteristics has a positive effect on firm performance of listed companies on the Stock Exchange of Thailand.

H2a: The size of board of directors has a positive effect on firm performance.

H2b: The size of audit committees has a positive effect on firm performance.

H2c: The proportion of independent directors has a positive effect on firm performance.

H2d: The proportion of women on boards has a positive effect on firm performance.

H2e: The frequency of board meetings has a positive effect on firm performance.

H2f: The frequency of audit committee meetings has a positive effect on firm performance.

H2g: The firm with a separate chairman and CEO has a positive effect on firm performance.

Research Hypothesis 3: Intellectual capital efficiency (VAIC) has a positive effect on firm performance.

Research Hypothesis 4: Intellectual capital efficiency links between board of director characteristics and firm performance.

H4a: The size of board of directors (LOGBSIZE) has an indirect effect on firm performance through intellectual capital efficiency.

H4b: The size of audit committees (LOGACSIZE) has an indirect effect on firm performance through intellectual capital efficiency.

H4c: The proportion of independent directors (PerBIND) has an indirect effect on firm performance through intellectual capital efficiency.

H4d: The proportion of women on boards (PerWOMEN) has an indirect effect on firm performance through intellectual capital efficiency.

H4e: The frequency of board meetings (LOGBMEET) has an indirect effect on firm performance through intellectual capital efficiency.

H4f: The frequency of audit committee meetings (LOGACMEET) has an indirect effect on firm performance through intellectual capital efficiency.

H4g: The firm with a separate chairman and CEO (BCEODUAL) has an indirect effect on firm performance through intellectual capital efficiency.

1.5 Conceptual Framework

The researcher built a conceptual research framework based on the literature review of the effect of board of director characteristics on firm performance though intellectual capital efficiency, the agency theory, and other related researches. 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 researches. Each type of variables was shown in figure 1.1 below.

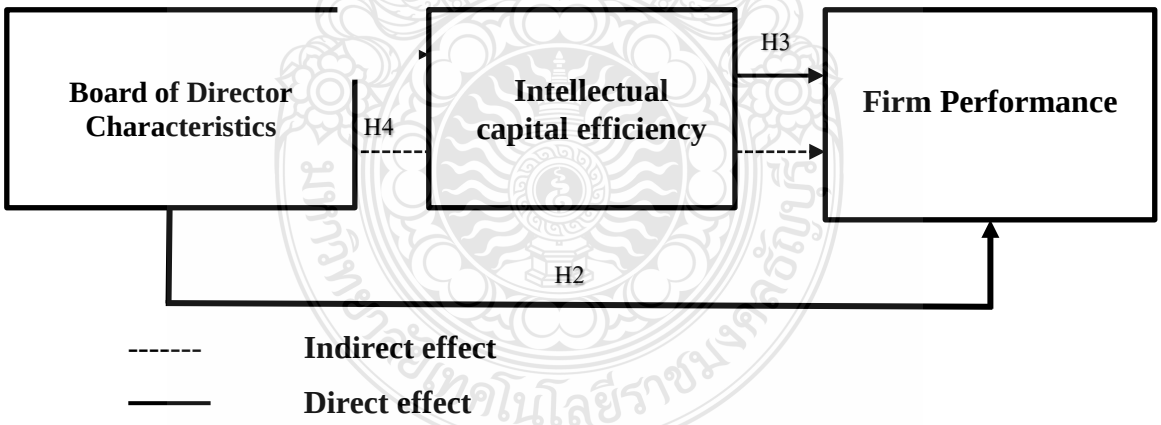

Figure 1.1 Conceptual Framework

1.6 Delimitation and Limitation of the Study

This study contained delimitations and 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.

1.6.2 The data collected and employed in this study concerning board tasks was based on the five good practices of corporate governance for SET-listed companies in 2014.

1.6.3 Promotion of a model with the ability to analyze the degree of influence of board of directors on firm performance and its intervening result on intellectual capital effectiveness was the aim of this study.

1.6.4 Various groups of companies, including those that were taken off the list and those rescinded or deferred, were left out of this study. Companies being reorganized and those containing partial information were excluded. Financial and security, banking, and insurance sector companies were left out as well. The unique fiscal structures and other traits of these companies compared to the companies chosen for inclusion served as the basis for their exclusion (Fabozzi & Drake, 2009).

1.7 Significance of the Study

Examining the influence of intellectual capital and their connection to board of director traits and firm performance using empirical data from Thai companies was the aim of this study. The following contributions were provided by the results of the study:

1.7.1 This study was likely the first focusing on an examination of the intervening influence of intellectual capital on a board of directors and firm performance using empirical data from Thai companies. In addition, the influence of board of director traits on intellectual capital and firm performance were also confirmed using the agency theory.

1.7.2 The literature review showed that board of directors influence each other, as confirmed by the findings of this study. The board of directors affected the value elevation of intellectual capital while enhancing the operation of the company.

1.7.3 The discoveries permitted organizations to benchmark themselves in light of the level of effectiveness rankings, build up needs, and create vital arrangements, which will upgrade their future execution accordingly. The discoveries could also help partners and financial specialists evaluate the esteem making capability of organizations and arrangement producers to define and execute approaches for foundation of a versatile organization.

1.8 Definition of Terms

1.8.1 The system of in-house measures and processes through which each company is operated comprises corporate governance. A framework that defines the rights, roles, and responsibilities of different three groups is included, consisting of management, board of directors, controlling shareholders, and minority or non-controlling shareholders within a firm. For firms with many minority shareholders spread throughout the world, this system and framework is especially significant.

1.8.2 The board of directors in charge of leading and decision making for firms works toward the best interests of their organizations and stakeholders. In order to guarantee all activities are carried out according to the law and ethical standards, a board must define its role and responsibilities apart from the role of managers in supervising the operation of an organization. Directors possessing a variety of qualifications, skills, experience, and expertise valuable to the firm should be members of a board. Directors must be obliged to their duties and emphasize on creating a board with strength and effectiveness for the firm. Nomination of board members should be done with transparency and no influence by existing managers or shareholders. From the perspective of outsiders, the elements of the board should appear reliable, and these elements include the size of the board, the size of audit commission, the degree of autonomy by the board, the number of female board members, the regularity of meetings, the regularity of audit commission meetings, and CEO duality.

1.8.3 The total of all knowledge that is held by persons in an organization defines intellectual capital, which offers the firm benefit if employed properly (Arenas & Lavanderos, 2008). Human capital competence and structural capital competence are

used to measure intellectual capital efficiency by capital employed efficiency with the intellectual capital efficiency (VAIC) method (Pulic, 2000).

1.8.4 Return on equity (ROE) is used to measure firm operation as a dependent factor.

CHAPTER 2
REVIEW OF THE LITERATURE

This chapter presented a review of previous studies and relevant literatures detailed in the impact of intellectual capital on board of directors and firm performance of listed companies on the Stock Exchange of Thailand. The chapter included the definition of each construct and the theoretical supporting though previous studies. The linkage of those constructs to formulate the related hypotheses for testing this study was also presented.

2.1 The Agency Theory

2.2 The Concepts of Corporate Governance

2.3 The Board of Directors Characteristics

2.4 The Concepts of Intellectual Capital

2.5 The Concepts of Firm Performance

2.6 The Effect of Board of Directors and the Intellectual Capital efficiency

2.7 The Effect of Board of Directors and Firm Performance

2.8 The Effect of the Intellectual Capital efficiency and Firm Performance

2.9 The Effect of Intellectual Capital Efficiency Linking Board of Director Characteristics and Firm Performance

2.10 Previous Studies

2.1 The Agency Theory

In the design of accounting research, the agency theory is applied in the same way in corporate governance. It is described according to the research of Jensen and Meckling (1976) as the two communities' relationship; one is so called the employer principal or the right and consent given for the available resources to the other groups so called the agent. If the relationship between both parties is utility maximization, it is the good reason to believe that the agent will not always act in the principal's best interests. The divergences can be limited by the principal from his interest via the proper establishment of agent incentives and the design for incurring costs monitoring in order to limit the agent's aberrant activities. Moreover, in particular circumstance, the

payment is given to the agent to expend resources (bonding costs) to confirm that the certain actions would not be taken to harm the principal or to make sure that the compensation will be given to the principal if such actions are not taken. Nevertheless, it is suggested from the agency theory that the modern business operations require for the large number of shareholders, but the management action in business does not form the highest return to those shareholders. In order to get a solution, it is suggested from the study of Jensen and Meckling (1976) that as the owner directly takes the business management control to guard the rights to be granted, it thus requires the agency theory as the special tools for minimizing agency damage.

An important tool to limit the damages from executives with guidance from a study by Donaldson and Davis (1991) is the board of directors. The board of directors is responsible for monitoring and checking executive acting on agency of all shareholders, which is to reconsider the role of the justice administration fully on the board of directors as an independent non-executive. In contrast, when the chair of the board of directors and chief executive officer (CEO) are the same person, the board does not split the responsibilities between management and audit control as a result. This will affect the adoption of the board to be fair.

Willekens et al. (2004) supported that corporate governance is important mechanism which can reduce the agent because it has contributed to increase control and monitor the behavior of agents more. Corporate governance mechanisms can increase disclosures of the success of both financial and non-financial companies, and consequences of the disclosure of this success can be applied to reduce the information asymmetry between agents and principals, thus contributing to the agency problems.

It is argued by Abidin, Kamal, and Jusoff (2014) that managers (agents) are hired by shareholders (principals) to form the decisions in the shareholders' best interest. The separation of control from ownership reflects the inability of the principal (shareholders) to exercise the full control over the managerial actions. The opportunistic behavior is assumed in agency theory, and the asymmetry information exists between the principals and agents (managers). Information asymmetry takes place when there is the competitive advantage of information in the management within the company more

than the owners. These result in two key conflicts between shareholders and management.

Dhnadirek and Tang (2003) studied on corporate governance problems in Thailand to investigate whether ownership concentration is the cause. They found that the financial reports are the same among the major shareholders who are non-directors which will increase the quality of reporting. Finance with a large share of the executive will tend to reduce the quality of financial reporting.

This study took the view of an agency theory to examine on this study issues. It is said by Coles and Hesterly (2000) that the relationship with agency is described as "a contract made with one or more persons (the principals) to engage with another person (the agent) for some service performance on their behalf involving with decision making authority assigning to the agent" (Jensen & Meckling, 1976). Thus, the focus of sgency theory is on the presence and conflict resolutions of the interest among agents and principals. In CEOs' case, the concern of agency theory is to insure the firm's managers to act for the shareholders' interests (owners). The assert of agency theory is for the firm to use so many mechanisms such as stock options, incentive compensation, and managerial monitoring in aligning and protecting of the principals' interests. These mechanisms constitute the governance structure of the firm.

Corporate governance and governance of knowledge are conceptualized by Kraft and Ravix (2008) as the concern is on the firm's competence and knowledge rather than markets and products. They elaborate that in contrast to the agency problem and market valuation, the definition of corporate governance is that the interaction and collaboration of investors and managers in the knowledge constructing and learning process, and competence to form the effective coordination between the interrelated resources and activities. In the examination by Saifieddine, Jamali, and Noureddine (2009), the relationship between intellectual capital efficiency and corporate governance was concluded with the certain relation between corporate governance and intellectual capital efficiency while the major factor attracting the organization intellectual capital efficiency is corporate governance. Furthermore, they argued that the absence of good corporate governance could result in the inability to retain and attract intellectual capital efficiency.

Therefore, the development of agency theory is around the two groups' contractual relationship concept with the conflicting objectives, i.e., principals and agents. The agency theory goal is to structure the contractual relationship between these groups so that the action is taken by agents to maximize the principal welfare. The problems associated with the objective accomplishment are as follows:

1. The utility function of agent is based on wealth utility and disutility for effort, while the utility function of principal is just based on wealth.

2. The impacts of both ex ante and ex post uncertainty.

3. The impacts of risk where it is assumed that the principal is the risk neutral and the agent is the risk averse.

4. The impacts of incentives and payoffs.

5. The moral hazard problem - not recognizing on the impacts of the agent's effort and randomness.

6. The adverse selection problem – being unable to determine the level of agent's skill.

The graphic reflecting the researcher's main ideas interpretation in this section was shown in figure 2.1 below.

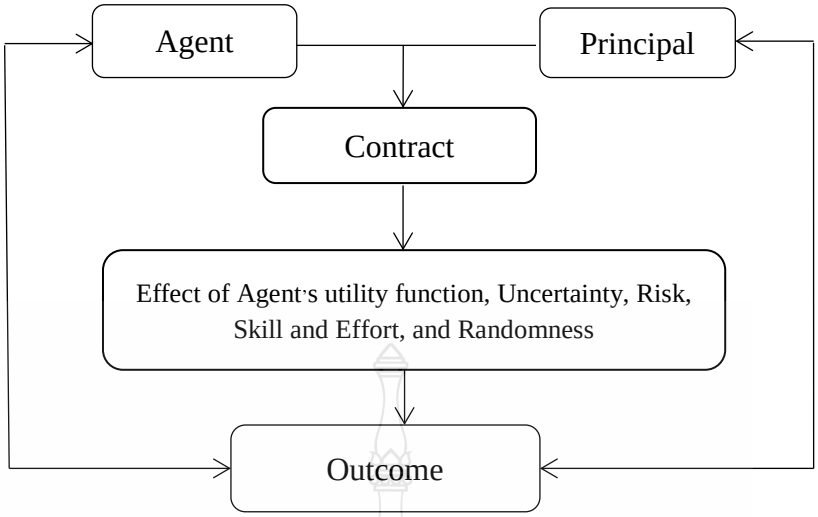

Figure 2.1 The Main Ideas of Agency Theory (Tiessen & Waterhouse, 1983)

2.2 The Concepts of Corporate Governance

2.2.1 Overview of Corporate Governance in Thailand

The Stock Exchange of Thailand has been assisted the Thai listed companies on the adoption of good governance according to the international standard. In 1995 before the financial crisis, it was the starting point when the roles of audit committee for listed companies were studied. Later on, in the beginning of 1998, a listing requirement was issued indicating as being effective since 1999 onwards that all listed firms had the audit committee. SET in that year also issued a guideline so called "Code of Best Practices for Directors of Listed Companies." Then, two years later the Good Corporate Governance Committee had the composition with the variety of professional organizations representatives to disseminate guidelines to report on corporate governance. These guidelines promoted the Thai listed companies to practice with good governance that would lead to the Thai capital market development on their recognition and transparency (SET, 2012).

Thai government has designated year 2002 as the "Compass for Good Corporate Governance" and then established the National Corporate Governance Committee (NCGC). In that same year, the Exchange related to good corporate governance implementation for the listed companies had proposed on the 15 principles. Since December 31, 2002 which is the end of accounting period the listed companies were required to show their annual registration statement (Form 56-1) and the annual reports on the way they applied in these 15 principles. The justification will be in place if none of these principles is selected to implement.

SET has established the Corporate Governance Center in July 2002 to assist the listed companies for the corporate governance system development. The consulting services are provided from the center to exchange the corporate governance practice concepts with the listed companies' directors and executives as well as for the companies that are preparing to become the listed companies.

The ongoing campaign and governance boost up for the listed companies has reflected on the better image of Thai capital market on good governance. The evidence can be seen in the international assessment below.

CG-Watch 2012 by ACGA ranked Thailand as the third out of 11 appraised Asia Countries (Thailand, Japan, Hong Kong, Singapore, India, Taiwan, China, Korea, Indonesia, Philippines, and Malaysia).

According to CG-ROSC 2012 by World Bank, the highest average score at 83% can be reached by Thailand as the first rank among the 11 voluntarily appraised Asia Countries (Thailand, Bhutan, Bangladesh, Hong Kong, India, Indonesia, Philippines, Nepal, Vietnam, Pakistan, and Malaysia).

Due to the ASEAN CG Scorecard 2012-2013 by IOD, Thailand achieved the highest average score at 67% as the top rank among the six voluntarily appraised ASEAN Countries (Thailand, Singapore, Indonesia, Philippines, Vietnam, and Malaysia).

SET listed companies' campaign and encouragement has realized on the importance and benefits of the good corporate governance. There are 15 items for the good governance for Thai listed companies as the guideline of practice. In 2006, corporate governance was improved for the listed companies in comparable with the Organization for Economic Co-Operation and Development (OECD) Principles of Corporate Governance 2004 and World Bank recommendations to join in Corporate Governance - Reports on the Observance of Standards and Codes (CG-ROSC). In 2012, corporate governance was improved again by the Stock Exchange of Thailand for the listed companies. The good practices were modified in five categories in compliance with the ASEAN Corporate Governance Scorecard (ASEAN CG Scorecard), a tool that is used for the level measurement. "Corporate Governance for Listed Companies" of the ASEAN countries consists of five categories.

2.2.2 The Principle of Good Corporate Governance for Listed Companies

The good corporate governance principles for listed companies include (1) rights of shareholders, (2) equitable treatment of shareholders, (3) role of stakeholders, (4) disclosure and transparency, and (5) responsibilities of the board. The details of these principles were as follows.

2.2.2.1 Rights of shareholders

The company is owned by the shareholders, and they control it by appointing the board of directors to act on their behalf. Shareholders are eligible to form the decisions for any significant changes in the company. Thus, the company must support the shareholders in their rights exercising.

The basic rights of shareholders are the right to (1) sell, purchase, or transfer shares, (2) share the company's profits, (3) obtain the adequate and associate information to the company on the regular basis and timely manner, and (4) participate and vote in the meetings of shareholders to remove or appoint the board members, appoint the external auditor, and form the decisions on any affecting company transactions, such as dividend payment, the company's articles amendments related to association or bylaws, increases or decreases capital, or extraordinary transactions approval.

There should be the full inform by shareholders on the procedures and criteria to govern on the shareholder meetings. They should provide the sufficient information on the issues to assign as each agenda item before the meeting. Shareholders must be capable of asking the directors both during the meeting and sending them the questions in advance. Besides, they should be allowed to suggest the agenda and vote by proxy.

The board of directors must be aware of the rights of shareholders and steer away from any action to breach those rights.

2.2.2.2 Equitable treatment of shareholders

All shareholders including those in the management positions, foreign shareholders, and non-executive shareholders should be equally and fairly treated. There should readdress on the minority shareholders whose rights were breached.

It is crucial to have the trust from shareholders on the use of money by the company's board of directors and management for the proper long-term benefits maximization for all shareholders. It should be ensuring by the board that every right of shareholder is protected with fair treatment. Moreover, all processes should be ensured from the board to allow for the equitable treatment of all in the shareholders meetings.

There should be the policy from the board to allow the minority shareholders to nominate the directorships candidates. Shareholders that are unable to vote in person must be allowed to vote by proxy and propose any advance agenda item added before the real shareholders meeting date. The board should place the procedures for preventing the use of internal information to abuse the self-dealing such as the relevant party transactions and insider trading.

It must request all of the directors and executives to disclose any interests to the board whether from their related parties or any matter or transaction that the executives who have such interests shall not join in the process of decision making for that issue.

2.2.2.3 Role of stakeholders

The company's stakeholders should be fairly treated according to their legal rights. The board of directors should offer the cooperation promoting mechanisms

between its stakeholders and the company to form financial stability, wealth, and the company's sustainability.

In corporate governance, stakeholders are included but are not limited to investors, employees, suppliers, shareholders, creditors, customers, the community where the company operates in, the whole society, the external auditors, the government, and competitors.

The clear policies of the fair treatment on every stakeholder should be placed by the board with the establishment of their rights according to the laws with the mutual agreements to be respected. Any actions considered as breaching the legal right of stakeholders should be banned, and any of them must be effectively readdressed.

The board should offer the mechanism for the stakeholders to involve in the company's performance improvement and help confirm for the sustainability of the company. In order for the effective participation of stakeholders, all the relevant information must be disclosed with them.

The stakeholders should have the effective way to communicate any concerns related to illegal or unethical practices to the board such as the inaccurate financial reporting, insufficient internal control, and so on. There should be the protection on the rights of any person to communicate on such of concerns.

The board should set clear social and environmental policies to make sure that the company would contribute toward the sustainable business development. All aspects required to be considered by the board on how its operations directly or indirectly affect the social and environment.

2.2.2.4 Disclosure and transparency

The board of directors should confirm to disclose all of the crucial information related to the company either on the financial or non-financial correctly and accurately in a timely basis with transparency via the fair and trustworthy easy-to-access channels.

Important information of the company consists of the financial reports and non-financial data specified in the Securities and Exchange Commission (SEC) and the Stock Exchange of Thailand (SET) regulations and other associated information such as the board tasks summary during the year and its committees, corporate

governance policy, environmental and social policies, and the aforementioned policies compliance by the company

The financial reports quality is crucial for the shareholders and outsiders in their decision for investment. It should be affirmed by the board that all of the financial report information is accurate and passed the independent external auditor audit.

The chairman of the board and the managing director (MD or CEO) seem to have the best position as the company's spokesperson. Nonetheless, another director or executive may be appointed by the board to work as a spokesperson. The person must perform careful duty. The board should also assign that person or department to work on the "Investor Relations or IR" function to communicate with the outsiders like shareholders, individual investors, institutional investors, analysts, and the relevant government agencies.

2.2.2.5 Responsibilities of the Board

The category of board responsibilities is to give the responsibilities, duties, and accountabilities of the board of directors to the shareholders and other stakeholders by taking into consideration all stakeholders' interests. The board of directors should use the high business ethical standards to effectively fulfill their responsibilities. The main responsibility of the board is to guide on the corporate strategy, managerial performance monitoring, the conflicts of interest prevention, and decent return for shareholders achieving (Asia Development Bank, 2014).

The focus of this study was on the area that is often overlooked by corporate governance which is the intellectual capital, namely responsibility of board of directors in intellectual capital development and the maximum efficiency achievement from the intellectual resources in order to obtain the higher financial performance.

2.3 The Board of Directors Characteristics

2.3.1 Definition of Board of Directors

The board of directors takes the crucial role in corporate governance for the company's best interests. The board has reliability for the shareholders and with the independence in management. They should possess vision, leadership, and independence to form the decisions for the company's and shareholders' best interests. There should be the clear separation by the board on its roles and responsibilities from those of management with the company's operations monitoring to make sure that all of the activities are run due to the law and ethical standards and the board best practices (SET, 2012).

The board structure should consist of directors that possess with various qualifications such as experiences, expertise and skills in which useful for the company. Directors should perform their responsibilities will the whole efforts to form the strong board.

The process of director's nomination must be transparent and has no impact on controlling over the shareholders or management as well as being credible in the eyes of outsiders.

For efficiency and effectiveness, it requires the board to establish the committees to screen and study on special tasks on the board behalf, especially on the issues that required for unbiased opinions. There should be the clear work scope from committees on the roles and responsibilities and working procedures such as the meetings and reporting to the board.

2.3.2 The Best Practice of Board of Directors (SET, 2012)

1) Board structure

It requires having the appropriate board size that consists of those with the necessary experience, skills, and agility sufficient to efficiently perform the duties. The board should set the appropriate amount of members according to the shareholders meeting approval and comprise at least 5 but not more than 12 directors.

2) The characteristics of auditing committee

The auditing committee must be at appropriate size with those who possess the required experience, skill, and agility sufficient to efficiently run on their duties. The auditing committee as approved from the meeting of shareholders should set for the proper amount of members with at least 3 directors.

3) The board independence

The definition of the company “independent director” should be carefully seen by the board as whether or not the SEC and the SET minimum specified qualification is proper for the company. Moreover, the board of directors should clearly state on the policy that independent directors who have served for the board for more than nine years since the first appointment shall subject for particularly rigorous review for the ongoing independence.

The board should have independent directors who can independently comment on the management performance. The amount of independent directors should exceed or meet with the requirement of SEC. The remaining directors must represent for each shareholder group, and the amount of directors should be proportional to each group ownership.

4) Gender on board

The board should be composed of directors who balance the group with diversity of skills, gender, and at least one non-executive director having former working experiences within the major industry in which the company is operating. The board should confirm on the diversity policy of the board and the number of years that the director has been with the company to disclose on the company’s website and annual report.

5) Board meetings

The board should set its agenda and meeting schedule in advance and then notify each of the directors the schedule for them to manage their time to attend the meetings. The amount of board meetings should be proper for the responsibilities and obligations of the board and nature of the company, but it at least requires having six meetings per year. If there is no monthly meeting, the board should receive a monthly report about the performance of the company in order to be prompt to ongoing monitor

the management performance. All directors should be encouraged by the chairman to attend the board meetings held during the year for at least 75%.

6) Audit committee meetings

The meeting schedule and agenda should be placed from the board in advance to inform each director the schedule for each member of the board to arrange their time to attend the meetings. The amount of board meetings should be proper to the board's obligations and responsibilities as well as the company's nature. However, it should meet at least four times a year. If it could not hold the monthly meetings, the board should receive the company's performance report in the month without meeting for the prompt and ongoing monitoring of the management performance. All directors should be encouraged by the chairman to attend all of the board meetings during the year for at least 75%.

7) The separation of chairman and CEO

As the diverse roles and responsibilities of the board from the managing director, and the board roles and responsibilities should be separated for both positions in order to balance the power, the two positions should be taken by two different individuals.

The independent directors should make up more than 50% of the board where:

(1) The Chairman of the Board (the "Chairman") and the chief executive officer (or equivalent)(the "CEO") is the similar person;

(2) The Chairman and the CEO are immediate family members;

(3) The Chairman is part of the management team; or

(4) The Chairman is not an independent director.

2.4 The Concepts of Intellectual Capital

2.4.1 Definition of Intellectual Capital

In the economy knowledge, dynamic role is played by intellectual capital during the value creation processing in all corporations. Intellectual capital offers the firms with the sustainable competitive advantage generating capacity and greater firm performance. Definitions of intellectual capital are varied from the research started in

early 1969s. The first one who proposed the concept of intellectual capital was Galbraith (1969) who described intellectual capital as the behavior that required for brain exercising while mentioning on the individual intellectual possessive (Huang & Jim, 2010). The word was defined by Itami (1987) as the intangible assets where it was called as "invisible asset" including particular brand name, reputation, customer information, technology, and corporate culture invaluable for the competitive power of the firm. Intellectual capital as defined by Edvinsson (1997) in the European Management Journal was the "knowledge that is able to convert into value." Meanwhile, intellectual capital is defined by Stewart (1997) as the intellectual material, including knowledge, information, intellectual property, and experience, which can bring to form wealth (Goh, 2005). However, according to Pulic (2000) and the method developed by Austrian IC Research Centre to measure the firm's intellectual capital, further known as "Value Added Intellectual Capita" (VAIC^{TM}) was used which it was so crucial to measure each resource contribution in order to add more value to the firm. In this regard, the resources which once an element in physical capital VAIC^{TM} (Value Added Capital Employed), human capital (Value Added Human Capital), and structural capital (Structural Capital Value Added)(Soedaryono, Murtanto, & Prihartina, 2012, Brown Jr. et al., 2005) stressed on intellectual capital with the ascertainable monetary value, giving the competitive edge for the firm and allow for self-differentiation from the competitors. Intellectual capital according to Rehman et al. (2011) is considered as one of the key strategic assets in knowledge base economy. Intellectual capital was examined by Muhammad and Ismail (2014) as an intangible asset including customer information, reputation, brand name, technology, and corporate culture that were invaluable to the competitive power of the firm.

In conclusion, intellectual capital refers to the sum of total knowledge possessed in every individual and organization which provided them the competitive advantage. As the intangible assets, they consisted of reputation, customer information, brand name, technology, and corporate culture that are invaluable to the competitive power of the company.

2.4.2 Components of Intellectual Capital

In general, the three components of intellectual capital are differently named by some researchers as the external structure (in comparison with the relational capital) (Gan & Saleh, 2008), internal structure (in comparison with the structural capital), and human capital (Ferreira, Branco, & Moreira, 2012). The intellectual capital is commonly divided into the three components as follows:

2.4.2.1 Human capital is termed as the knowledge taken with the employees when they leave the firm including the people ability, knowledge, skills, and experiences. For individual, some of this knowledge is unique while it may be generic to some. Examples are the capability in creativity, know-how, innovations and former experience, employee flexibility, teamwork capacity, learning capacity, tolerance for ambiguity, satisfaction, motivation, loyalty, education, and formal training.

2.4.2.2 Internal capital (structural capital) is termed as the knowledge within the firm after the end of the daily working. This comprises the organizational systems, cultures, routines, procedures, databases, and so on. Examples are such as the existence of a knowledge center, the organizational flexibility, a documentation service, organizational learning capacity, and the general use of information technologies. Some of them could be legally protected and raised as the intellectual property rights, legally owned by the firm under the separate titles.

2.4.2.3 External capital (relational capital) is termed as all connecting resources with the external relationships of the firm with suppliers or R&D partners and customers. It consists of the human stakeholders (i.e. investors, creditors, customers, suppliers) side and the perceptions they have about the firm. Examples are such as the customer loyalty, customer satisfaction, image and connection with commercial power, suppliers, negotiating with the financial entities capacity, environmental activities, and so on. Therefore, the classification was illustrated in the following diagram.

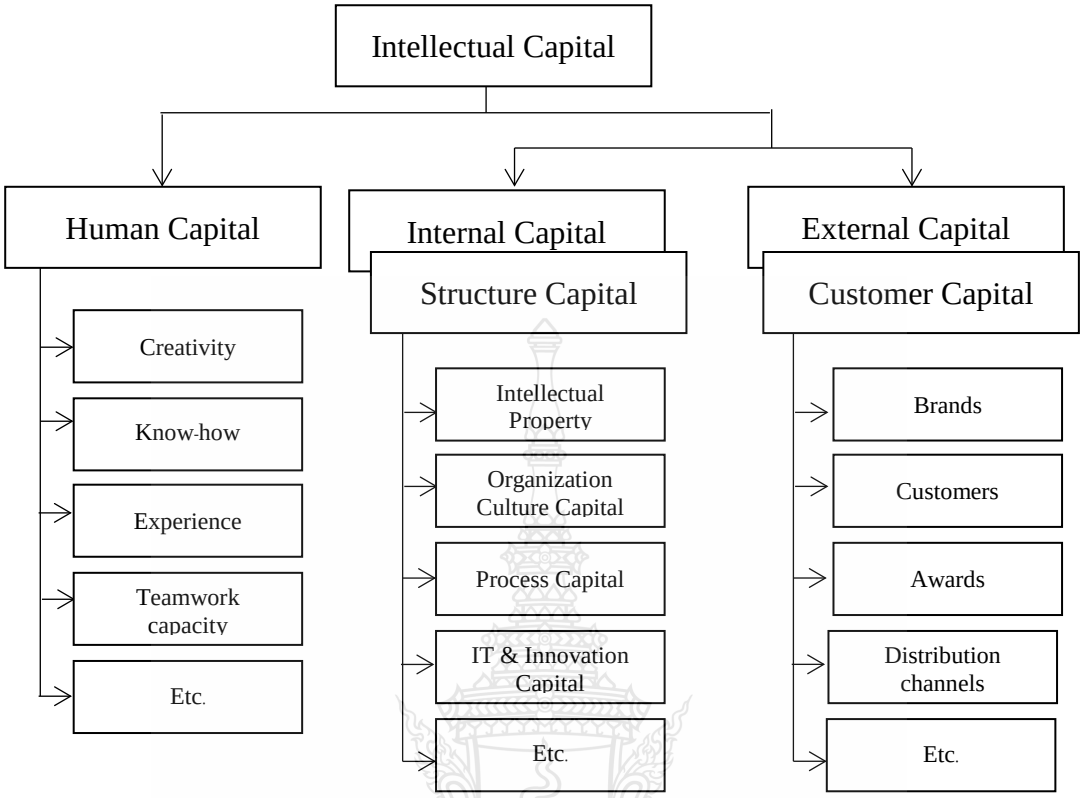

Figure 2.2 Intellectual Capital Classification (Gan & Saleh, 2008)

2.4.3 Measurement of Intellectual Capital

In today's economic realities, the net profit cannot be treated as the only success indicator. Managers note that it is important to invest in intangible resources of the company such as human resources, information technology, and research and development, which determine the image of the company on the market, its growth, and success as well as give a chance to the company to achieve a competitive advantage and ensure long-term financial success (Fijałkowska, 2014). The measurement and management of intellectual capital have received much attention from many researchers and practitioners.

These models can be categorized mostly into two groups which are non - monetary valuation models and monetary valuation models.

Key non-monetary valuation models of intellectual capital are:

(1) Balanced Scorecard Method (Kaplan & Norton, 2001);

(2) Intellectual Capital-Index (Woodcock & Whiting, 2009; Abeysekera, 2010; Ferreira, Branco, & Moreira, 2012); and

(3) Skandia Value Scheme (SVS)(Edvinsson, 1997). Key monetary valuation models of intellectual capital are:

(1) Value Added Intellectual Coefficient (VAIC^{TM})(Pulic, 2000); and (2) Intangible Assets Monitor (IAM)(Sveiby, 1997).

2.4.4 Value Added Intellectual Coefficient (VAIC^{TM})

2.4.4.1 Development of Value Added Intellectual Coefficient (VAIC^{TM})

The method of VAIC^{TM} allowed the firm to measure on its value orming creation efficiency (Pulic, 2001, 2002). The method of VAIC^{TM} used the firm financial statements in efficiency coefficient calculation on three capital types which were the human capital, structure capital, and capital employed. Though accounting data were used by VAIC^{TM}, the focus was not on the cost of the firm but the resources efficiency to form value to the firm (Muhamma & Ismail, 2014).

Value Added Intellectual Coefficient (VAIC) as proposed by Pulic (2000) was an indirect measure of the value added efficiency by the corporate intellectual capital. It was provided by the method of VAIC^{TM} the information related to either tangible and intangible assets efficiency which can be applied for value generation to the firm. Financial capital (monetary and physical), structural capital, and human capital have known as the key VAIC components. The higher the VAIC value, the greater the efficiency in capital exercising by the firm because VAIC is calculated as the capital employed efficiency, human capital efficiency, and structural capital efficiency in sum. Pulic (2001) identified that firms' market value was formed by the capital employed (physical and financial) and intellectual capital.

The study by Stahle, Stahle, and Aho (2011) on "value added intellectual coefficient (VAIC): a critical analysis" showed the value added intellectual coefficient (VAIC) known as "VAIC model" which Pulic (2000) who is one of the first scholars in the intellectual capital research field explicitly focused on the connection between economic performance and intellectual capital. At first, his analysis was solely based on the figures in the company balance sheet such as financial indicators. Another factor that sets Pulic apart from the rest in this field was his straightforwardly applying

the established intellectual capital concepts in the firm economics realm. His model assigned the apparent economic values, value added (VA), and capital employed (CE), to human capital (HC) and structural capital (SC) and then generated an unambiguous VAIC index on this basis. VAIC was used in many of regional and national analyses to research on the individual companies' performance. Quotes were also frequently made in the academic research but, it had never yet been either subjected for the formal analysis or critical conceptual or further elaborated.

1) Physical capital (CEE – Capital employed efficiency)

Physical capital employed efficiency was the indicator for the value added as generated from the company's afforded capital with efficiency (Firer & Williams, 2006). Examples of the physical capital or capital employed efficiency were land, buildings, technology, and equipment which can easily be traded in the market. The argument could be made that the physical capital or capital employed efficiency were the assets in physical form that did not own by the company and were efficiently used and optimally in the company's operations to form the added value in concerning of the companies.

2) Human capital (HCE - Human capital efficiency)

Puntillo (2009) explained that human capital consisted of people who formed the organization and contributed toward its success via their motivation and skills. At each organization's basis, people or better system of knowledge, competencies, creativity, innovation, and capabilities were founded in individual operating personnel knowledge and also the organization entrepreneurial and working qualities together in the business institution constitute.

It can also be said that human capital can be the most decisive element to form the company added value. Including as the human capital, the intellectual capital power came from people who owned the company with the competent employees who committed and motivated to work with loyalty and become the core to create the intellectual power which will disappear if it is not working for other companies (Cabrita & Bontis, 2008). It is apparent that human capital is the spearheading in companies' value added forming. In practice, the values embodied in human capital were not reflected from the company financial statements, but the expenses incurred from the

investment on employee development which is the intellectual capital of the company. According to Stewart (1997), it can be said that if it is intended by the company to form the intellectual abilities in the progress of their people, the company should be capable of distinguishing between the costs incurred to pay the employees and the investment by the company. Thus, this is apparent that the costs for the company's employee's expansion did not constitute in a form of investment but as the company's cost. These investments can be considered as efficient if the aim of the investment is to form the employees who can give the positive impact on the increase of firm performance.

3) Structural capital (SCE – Structural capital efficiency)

Structural capital was that made the firm remained on the strength since the achieved progress for the company. Further structural capital can be anything as the company resources in which unrelated to the humans. It may consist of organizational structure, a series of processes, database, strategies, and anything that can form the higher values to the company rather than the material stated values in the company's financial statements. The company's capital structural strength consequence will support on each individual in the company to learn more and try on new things. It was stated by Soedaryono et al. (2012) that the corporate culture and management philosophy were part of the structural capital that the company has, and in this regard the management philosophy is the way for the leaders in the company to think about the organization and employees with the outstanding effects on the corporate culture. This was the way for the companies to see their own company leaders and employees with the considerable effects on the corporate culture.

2.4.4.2 Value Added Intellectual Coefficient (VAIC^{TM}) measurement

The intent of VAIC model was to measure on the extent of the value added formed by the company based on the intellectual (capital) efficiency or intellectual resources. The examination was made by Gan and Saleh. (2008) on VAIC computing procedure in the following three steps:

Step 1:

Value added (VA) calculation from the difference between total revenues and total expenses excluding employee expenses (Riahi-Belkaoui, 2003).

When value added (VA) was calculated:

VA = Out – In

Where:

Out = All products and services total income as sold during the period; and

In = All expenses from the company operating not included the employee expenses.

It will be the employees' compensation expenses with total expenses related to their training and development.

Step 2:

Calculation of physical capital employed (CE), human capital (HC), and structural capital (SC).

Capital employed (CE) was the difference between total assets and intangible assets or physical and financial assets.

CE = Total assets – Intangible assets

Human capital (HC) is basically interpreted as employee expenses.

HC = Employee expenses

Structural capital (SC) is interpreted as the difference between produced added value (VA) and human capital (HC).

SC = VA – HC

Step 3:

The final step was the physical capital employed efficiency (CEE), human capital efficiency (HCE), and structural capital efficiency (SCE) computing where these values were derived from the formulas below:

Capital employed efficiency (CEE) = VA/CE

Human capital efficiency (HCE) = VA/HC

Structural capital efficiency (SCE) = SC/VA

Value added efficiency (VAIC): VAIC = CCE+HCE+SCE

VAIC is referred to as the relational index that produced value added in comparison with the capital employed and human capital (i.e. employee expenses).

When structural capital becomes zero (or negative), VAIC may take zero (or negative) values (Berzkalne & Zelgalve, 2014).

The VAIC method calculated on both total company's efficiency and its intellectual capital efficiency. VAIC was based on two major assumptions:

(1) The company's added value generating was based on the use of physical and intellectual capital; and

(2) The added value created for the company was linked with the whole efficiency.

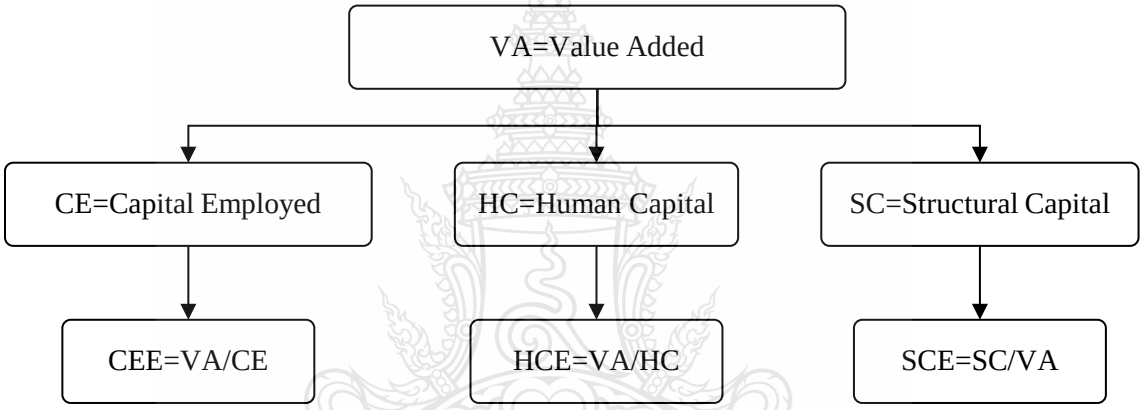

Figure 2.3 Summarizing the Procedures for Computing VAIC (Pulic, 2000)

2.4.4.3 The Value Added Intellectual Coefficient (VAIC^{TM}) method advantages

In fact, Pulic (2000) had introduced these variables to measure on the firm's intellectual capital using the one that can evaluate the firm's intellectual ability. This method computes the value creation efficiency of either tangible or intangible assets where the advantages of this method were explained by Hang Chan (2009) as follows:

(1) This coefficient was simply to calculate since it had no need for any subjective classification, and it can be either objectively or straightforwardly measured.

(2) It was the proper measure since the coefficient contained the information that was useful shareholders and everyone including shareholders where this coefficient can be employed in the firm performance evaluation.

(3) This coefficient can be used as a financial measure.

(4) It was simple to apply this for calculation and analysis since understanding this coefficient was simple for the business entity's business personnel and managers with the familiarity to the traditional accounting information.

(5) This coefficient was the basic standard for measurement – it can be used in the comparison between industries and firms at the national level.

(6) Financial data were employed for this coefficient calculation as an evidence for this method reliability and the usefulness of the information obtained. This method was consistent to the shareholders' viewpoint and the resource-oriented view in which the added value approach was used.

(7) This index was used in most of intellectual capital research studies in many countries.

(8) Some certain advantages were given from the use of this measurement:

(9) Consistency;

(10) Simple;

(11) Possible for the comparison between countries and industries as a standardized measurement; and

(12) Reliability of data since the financial statements data was usually audited via the professional public accountants.

2.5 The Concepts of Firm Performance

Richard et al. (2009) explained performance as the last dependent variable of interest for those in any areas of management:

- Accounting performance with ROE, ROA, ROI, sales growth, etc.

- Marketing performance with customer satisfaction, market share, etc.

- Operations management performance with cost of operations, productivity, etc.

- Organizational behavioral performance with employee satisfaction, structural efficiency, etc.

- Financial Market performance with Tobin Q, price to earnings ratio (P/E ratio), economic value added, earnings per share (EPS), market value (market capitalization), etc.

Different measurements were suggested from the literature on firm performance. Theoretically, there was none of theoretical or practical justification to prefer one measurement over the others. For the researcher to carry out the analysis, the variables should be selected in correlation with the dependent variables.

2.6 Control Variables

In this part, the former researches barely contained the control variables in the analysis. To make the accurate test on the associations of intellectual capital efficiency and firm performance, the proxy measures for each control variable were given below.

Big-4 auditors: They were included for audit quality control. In comparison to the low quality auditors, it is more likely that the high-quality auditors will require the client companies to reveal additional information. High growth companies could have more incentives in information disclosing in order to lessen the higher information asymmetry between investors and managers.

Industry: It is found by Kujansivu (2007) that intellectual efficiency is varied from industry to industry. Chen et al. (2005) and Tan et al. (2007) split VAIC and performance regression models into samples of industry and seek for the significant differences in the industries' explanatory power. In consistent with Firer and Williams (2003), this study controlled the industry via dummy control variable which is similar to the year dummy variable, and the nine dummy variables are represented for the effects of ten different industries as defined by the industry sector code. These industries range from the high intellectual capital companies via their physical resource basis like those in the utilities and materials industries. Each variable is coded as 1 if an observation shows the relevant with the industry represented by that variable.

Firm age: Two hypotheses on the firm age role on R&D investments are plausible. It is suggested from one that the older firms can develop the routines in resistant to innovation. Another suggests that the older firms can gather the necessary knowledge for innovation. The researcher added the number of years since the establishment of the firm from the registration period to the end of 2014.

2.7 The Effect of Board of Director Characteristics and Efficiency of Intellectual Capital

2.7.1 The Size of Board of Directors

Zamani et al. (2012) who applied VAIC^{TM} for a study of listed companies on the Tehran Stock Exchange. In the same way, in Malaysia, Abidin et al. (2009) revealed positive correlation between increased board size and efficiency of intellectual capital, along with a similar positive link between the efficiency of intellectual capital and the number of non-executive directors. Abeysekera (2010) found the positive influence of board size on intellectual capital by Kenyan listed firms.

In contrast, a positive relationship found by Yermack (1996) was quite different since a negative relationship was revealed a linking efficiency of intellectual capital and board size when the data from 452 US companies were analyzed. Cerbioni and Parbonetti (2007) in European reported that the size of the board negatively influences the quantity of intellectual capital. On the other hand, Kiel and Nicholson (2003) argued that larger boards should provide more opportunities for networking and additional skilled personnel so that they contribute towards better performance.

These previous findings permitted the formulation of the following hypothesis:

Hypothesis 1a: The size of board of directors has a positive effect on intellectual capital efficiency.

2.7.2 The Size of Audit Committees

In Malaysia, Mahmudi and Nurhayati (2015) stated that audit committees serve as a useful mean of controlling the management of a company, so it could be argued that a committee with more members would be better able to monitor the activities of the company. A large audit committee would thus be anticipated to support the efficiency of intellectual capital. Meanwhile, the findings of Taliyang (2011) found

that the size of the audit committee does not have a significant relationship with the intellectual capital value in Malaysia.

In contrast, Ranjith and Mohammad (2015) found no evidence that audit committee size has an effect on intellectual capital efficiency in the top service firms in Australia. Cerbioni and Parbonetti (2007) discovered that the effect of audit committee size upon the quality of intellectual capital was negative in European.

These previous findings permitted the formulation of the following hypothesis:

Hypothesis 1b: The size of audit committees has a positive effect on intellectual capital efficiency.

2.7.3 Proportion of Independent Directors

When directors are independent, they have traditionally been more inclined to encourage long-term managerial thinking and ideas which are in the best interests of the business in Malaysia (Ibrahim et al., 2003). Moreover, the work of Al-Musalli and Ismail (2012) confirmed that there is a significant link between intellectual capital performance and the number of independent directors serving on the board in Arab Gulf Cooperation Council (GCC) countries. Similarly, it is confirmed by Mahmudi and Nurhayati (2014) that the proportion of independent directors exerts a significant influence upon the efficiency of intellectual capital in Malaysia company, so it can be anticipated that the presence of independent directors will have a positive outcome in terms of intellectual capital, leading to greater investment in research, human resources, and information technology.

In contrast, some studies indicated different findings. In Nigeria, Angaye et al. (2009) found that there is not a significant link between intellectual capital performance. In India, Malhotra and Thenmozhi (2013) argued that the proportion of independent directors exerts a not significant influence upon the efficiency of intellectual capital. Besides, Ho and Williams (2003) covered link between board structure and intellectual capital efficiency in a sample of South African, Sweden, and UK listed companies, but they could not find any relationship among independent directors.

These previous findings permitted the formulation of the following hypothesis:

Hypothesis 1c: The proportion of independent directors has a positive effect on intellectual capital efficiency.

2.7.4 Proportion of Women on Boards

A study of listed companies in South Africa by Williams (2001) showed that a when boards comprise a balance of members in terms of ethnic and gender backgrounds, there is an improvement in their efficiency of intellectual capital. On the other hand, Swartz and Firer (2005) concluded that racial diversity is positively related to intellectual capital performance in a sample of 117 public listed companies in South Africa. Furthermore, Van der Zahn (2006) showed the percentage of female directors on board of directors has a significant positive relationship with intellectual capital performance in South Africa.

Contrary to the above findings, in South Africa, Khumalo (2011) revealed that no material difference is created when the proportion of female directors is low. Simkins and Simpson (2010) found that there was no association between female directors on the board and efficiency of Malaysia.

These previous findings permitted the formulation of the following hypothesis:

Hypothesis 1d: The proportion of women on boards has a positive effect on intellectual capital efficiency.

2.7.5 Frequency of Board Meetings

Goh (2005) stated that the potential of good Malaysian company performance can be seen from the efficiency of intellectual capital performance. Besides, the findings of Brick and Chidambaram (2007) stated that company performance tends to rise when more board meetings are held. The results of the study by Al-Musalli et al. (2014) supported the hypothesis that the effect of board meetings on intellectual capital performance is positive as the effectiveness of increases in Arab Gulf Cooperation Council (GCC) countries.

Contrary to the above findings, Mahmudi and Nurhayati (2015) argued that an increase in the frequency of board meetings does not necessarily improve intellectual capital performance since the effectiveness of meetings plays a more significant role than the mere number of meetings held.

These previous findings permitted the formulation of the following hypothesis:

Hypothesis 1e: The frequency of board meetings has a positive effect on intellectual capital efficiency.

2.7.6 Frequency of Audit Committee Meetings

In UK, Karamanou and Vafeas (2005) argued that audit committees that meet more frequently would have more time to perform the role of monitoring the corporate reporting process more efficiently. Abbott et al. (2000) argued that the frequency of audit committee meetings shows their desire to fulfill their responsibilities in Malaysian evidence. Those who still hold frequent meetings, despite their busy schedules, emerge as an effective committee in enhancing corporate financial reporting quality in the Australian Stock Exchange (ASX) (Kang et al., 2011). However, according to Li et al. (2008), there is a positive relationship between the frequency of audit committee meetings and the efficiency of intellectual capital in Indonesia. Meanwhile, in Poland, Bohdanowicz (2014) found that the frequency of audit committee meetings has a negative effect on the efficiency of intellectual capital.

On the other hand, other studies found no association between audit committee meetings and intellectual capital performance (Mahmudi, 2014). In the Malaysian context, Abdul Rahman (2006) found no relationship between the frequency of audit committee meetings and financial reporting quality.

These previous findings permitted the formulation of the following hypothesis:

Hypothesis 1f: The frequency of audit committee meetings has a positive effect on intellectual capital efficiency.

2.7.7 Combined Role of Chairman and CEO

Abidin, Kamal, and Jusoff (2014) found that duality may lead to better performance because the structure creates clarity in establishing responsibility for the various internal and external processes of the company. Also, Gul and Leung (2004) found that in Hong Kong when the roles of the CEO and the chairman are combined, the levels of voluntary corporate disclosures are lower.

In contrast, it was suggested by Butt (2012) that if a single person takes the roles of both CEO and chairman of the board, the situation of duality arises. Since both are powerful posts, duality can concentrate a significant amount of power in one person,

who then controls both the board and the management. This can lead to excessive support for the actions and interests of the management at the expense of the shareholders. It also reduces the board's capacity for monitoring and oversight. The study of Ho et al. (2003) focusing on listed companies in the UK, Sweden, and South Africa found that duality was linked to negative outcomes for intellectual capital, but no link was established between duality and VAIC^{TM}.

These previous findings permitted the formulation of the following hypothesis:

Hypothesis 1g: Firm with a separate chairman and CEO has a positive effect on intellectual capital efficiency.

2.8 The Effect of Board of Director Characteristics and Firm Performance

2.8.1 The Size of Board of Directors

It has been shown that a larger board is positively related to a company's performance (Jackling & Johl, 2009) whereas evidence has also shown that the size of the board can exert a significant negative effect upon profits, returns to shareholders, and Tobin's Q (Guest, 2009). Furthermore, Chen et al. (2008) pointed out that the larger the board, the greater the incidence of difficulties pertaining to inefficient directors. A significant negative correlation was discovered between board size and ROE in a study of the Thai banking sector (Pathan et al., 2007) while the work of Kiel and Nicholson (2003) examined the company performance in the light of board composition and discovered a positive link between performance and the size of the board.

These previous findings permitted the formulation of the following hypothesis:

Hypothesis 2a: The size of board of directors has a positive effect on firm performance.

2.8.2 Size of the Audit Committee

It is possible for an audit committee to become too big, whereas its processes become ineffective, and the responsibilities of members become too widely diffused for the committee to work effectively (Karamanou & Vafeas, 2005). Similarly, Al-Matari et al. (2012) discovered the significant negative links between the size of the audit committee and the performance of companies. However, some of the previous studies indicated that smaller audit committee size improves firm performance because large

audit committee size may reduce cooperation in the committee (Lin et al., 2008). AbdurRouf (2011) investigated the relationship between the size of audit committee and the performance of the firm (ROA and AOE) in the Dhaka Stock Exchange in 2006 using a sample of 93 non-financial listed firms. It was found that there is no significant relationship between audit committee size and firm performance. Furthermore, Mak and Kusnadi (2005) studied the relationship between corporate governance and firm performance in Malaysia and Singapore, and they could not find any significant association between the audit committee and the value of the firm. Klein (2002) indicated that larger audit committee size leads to reduce the earnings management due to the positive relationship between audit committee size and firm performance. However, some of the previous studies indicated that smaller audit committee size improves the firm performance because large audit committee size may reduce cooperation in the committee (Lin et al., 2008).

These previous findings permitted the formulation of the following hypothesis:

Hypothesis 2b: The size of audit committees has a positive effect on firm performance.

2.8.3 Proportion of Independent Directors

It has been argued that the percentage of independent directors who make up the board of directors can affect the performance, and Pathan et al. (2007) confirmed this view by finding a positive and significant link between ROE and the proportion of directors who were independent. In addition, the composition of the board was found to positively influence ROE and profits in a study by Connelly and Limpaphayom (2004). For non-family businesses, Leung et al. (2014) reported that the independence of the board is positively correlated with firm performance while the work of Khan and Awan (2012) found the positive links between the returns on assets and equity and the presence of non-executive directors on corporate boards. However, Ghosh (2006) was unable to link board and corporate performance when examining India's manufacturing sector.

These previous findings permitted the formulation of the following hypothesis:

Hypothesis 2c: The proportion of independent directors has a positive effect on firm performance.

2.8.4 Proportion of Women on Board

A number of research studies have examined the issue of proportion of women on boards. Abdullah et al. (2012) conducted a study in Malaysia to assess the effects on market performance of including female members on the boards and found that a female presence was associated with a significant positive influence on ROE. Carter et al. (2003) were also able to show that an increase in the proportion of female directors could improve firm performance whereas Dobbin and Jung (2011) addressed the question of whether female directors could enhance profitability and stock market value. The findings indicated that a higher proportion of females is not linked to any increase or decrease in profitability. In the U.S., Adams and Ferreira (2009) found that the overall influence of female directors on corporate performance was negative, and thus the summary of these findings would be that companies which have a higher percentage of female directors cannot expect to see any correlated effect on profitability.

These previous findings permitted the formulation of the following hypothesis:

Hypothesis 2d: The proportion of women on boards has a positive effect on firm performance.

2.8.5 Frequency of Board Meetings

The findings of Vafeas (1999) showed that a positive relationship exists between the frequency of board meetings and firm performance, and therefore the researcher suggested that the activities of the board play an important role in guiding the company. This is further supported by Brick and Chidambaram (2007) who revealed that the actions of the board have a positive impact on firm performance. However, the findings of Jackling and Johl (2009) indicated no links between the frequency of board meetings and the financial performance of companies in India.

These previous findings permitted the formulation of the following hypothesis:

Hypothesis 2e: The frequency of board meetings has a positive effect on firm performance.

2.8.6 Audit Committee Meeting Frequency

It was suggested by Stewart and Munro (2007) that ROE is positively influenced by the frequency of audit committee meetings. Meanwhile, Anderson et al. (2004) added that the audit committee plays a key role in supervising the internal controls of a company, thereby allowing vital information to be transmitted to the shareholders. The internal audit system is thus strengthened, and the appropriate oversight of management can lead to lower business risks. Azam et al. (2010) studied companies in Australia and found that equity returns were positively affected by the frequency of audit committee meetings. Therefore, it can be argued that the frequency of audit committee meetings has a role to play in determining how effective an audit committee will be in performing its supervisory role (DeZoort et al., 2002). Aibaba and Ansari (2013) also found that there is a positive relationship between the audit committee and the financial performance of a firm.

These previous findings permitted the formulation of the following hypothesis:

Hypothesis 2f: The frequency of audit committee meetings has a positive effect on firm performance.

2.8.7 Combined Role of Chairman and CEO

Ramdani and Witteloostuijn (2010) studied the effects of duality in Malaysia, Indonesia, South Korea, and Thailand and discovered positive links between duality and corporate performance. In contrast, Judge et al. (2003) found the links to be negative between duality and performance, and the study of Russian companies. Fooladi et al. (2011) confirmed this negative relationship using ROE and ROA as the indicators for financial performance. The study of UK listed companies found similar results whereby duality is associated with poor financial performance (Veprauskaite & Adams, 2013).

These previous findings permitted the formulation of the following hypothesis:

Hypothesis 2g : The firm with a separate chairman and CEO has a positive effect on firm performance.

2.9 The Effect of the Intellectual Capital Efficiency and Firm Performance

Three elements of intellectual capital efficiency, including human capital efficiency, capital employed efficiency, and structural capital efficiency, can be found consistently in the literature. These can be applied in accordance with the extended VAIC^{TM} model (Pulic, 2000), intellectual capital indicators are as follows:

Links between firm performance and intellectual capital were examined by Berzkalne and Zelgalve (2014) with the conclusion that a rise in the latter should lead to an increase in the former. Similarly, Nimtrakoon (2014) discovered that the relationship between intellectual capital and the stock market value of a company was also positive, incdicating that strong performance in the area of intellectual capital usually results in improved ROA. However, Maria (2014) revealed that the relationship between VAIC^{TM} and market-to-book value was negative and found no significant links between VAIC^{TM} and ROE. The work of Muhammad and Ismail (2014) showed significant positive links between intellectual capital and both ROA and profits whereas Tan et al. (2007) showed that present and future company performance was positively linked to intellectual capital performance in the study of 150 Singaporean companies. A further study by Chen et al. (2005) investigated the influence of intellectual capital efficiency on the traditional corporate performance measures using data from the companies listed on the Hong Kong Stock Exchange during the period 2001-2005.

These previous findings permitted the formulation of the following hypothesis:

Hypothesis 3: Intellectual capital efficiency (VAIC) has a positive effect on firm performance.

2.10 Mediation of the Efficiency of Intellectual Capital

The mediation process comprises four steps (Baron & Kenny, 1986). The following descriptions explain why the efficiency of intellectual capital is a relevant mediator in each of the four steps.

1) All relationships between dependent and independent variables have to be significant. A significant relationship is evidenced in the literature for firm performance and the characteristics of the board of directors (Connelly & Limpaphayom, 2004;

Karamanou & Vafeas, 2005; Ghosh, 2006; Chen et al., 2008; Jackling & Johl, 2009; Azam et al., 2010; Dobbin & Jung, 2011; Fooladi et al., 2011; Abdullah et al., 2012).

2) All relationships between independent and mediator variables have to be significant. A significant relationship is evidenced in the literature for the efficiency of intellectual capital and the characteristics of the board of directors (Ho et al., 2003; Carter et al., 2003; Cerbioni & Parbonetti, 2007; Brick & Chidambaram, 2007; Abidin et al., 2009; Makki & Lodhi, 2009; Khumalo, 2011; Butt, 2012; Al-Musalli & Ismail, 2012; Mahmudi & Nurhayati, 2014; Mahmudi & Nurhayati, 2015).

3) All relationships between dependent and mediator variables have to be significant. A significant relationship is evidenced in the literature for the efficiency of intellectual capital and firm performance (Chen et al., 2005; Chan, 2009; Ze´ghal & Maaloul, 2010; Komnenic & Pokrajcic, 2012; Mehralian et al., 2012; Pal & Soriya, 2012).

4) In the case where it is possible to reduce the direct link between the characteristics of the board of directors and firm performance to zero when the efficiency of intellectual capital is included, such that the indirect relationship involving the mediator becomes significant, and then full mediation is confirmed. However, if the link is reduced significantly, then partial mediation is demonstrated while a significant direct link indicated no mediation.

Hypothesis 4a: The size of board of directors (LOGBSIZE) has an indirect effect on firm performance through intellectual capital efficiency.

Hypothesis 4b: The size of audit committees (LOGACSIZE) has an indirect effect on firm performance through intellectual capital efficiency.

Hypothesis 4c: The proportion of independent directors (PerBIND) has an indirect effect on firm performance through intellectual capital efficiency.

Hypothesis 4d: The proportion of women on boards (PerWOMEN) has an indirect effect on firm performance through intellectual capital efficiency.

Hypothesis 4e: The frequency of board meetings (LOGBMEET) has an indirect effect on firm performance through intellectual capital efficiency.

Hypothesis 4f: The frequency of audit committee meetings (LOGACMEET) has an indirect effect on firm performance through intellectual capital efficiency.

Hypothesis 4g: The firm with a separate chairman and CEO (BCEODUAL) has an indirect effect on firm performance through intellectual capital efficiency.

2.11 Previous Studies

Table 2.1 Summary of the literature relating board of directors and intellectual capital efficiency

Author	Title	Independent Variable	Key Findings
Al-Musali & Ismail (2015)	Board Diversity and Intellectual Capital Performance: The Moderating Role of the Effectiveness of Board Meetings	- Board meeting - Board size	Based on the hierarchical regression analysis, the results do not support the hypothesis that the effect of board diversity on intellectual capital performance is positive as the effectiveness of board meetings increases.
Mahmudi & Nurhayati (2014)	The Influence of Board Governance Characteristics on Intellectual Capital Performance	- Proportion of board independence - FrFirm performance.equency of audit committee meetings - Size of audit committee - Board meeting	The result showed the proportion of board independence and size of audit committee is a significant effect between intellectual capital performances while the frequency of audit committee meetings is not significant.
Abidin et al. (2014)	Board Structure and Corporate Performance in Malaysia	- CEO duality - Total number of directors - Percentage of independent non-executive directors	Based on a randomly selected sample of 75 listed companies on Bursa Malaysia. The result showed the total number of directors and the percentage of independent non-executive is positively significant while the EO duality is not significant.

Table 2.1 ummary of the literature relating board of directors and intellectual capital efficiency (Cont.)

Author	Title	Independent Variable	Key Findings
Al-Musalli & Ismail (2012)	Intellectual Capital Performance and Board Characteristics of GCC Banks	- Board size - The number of independent directors	The result showed the board size and the number of independent directors has a significant negative relationship with intellectual capital performance.
Van der Zahn (2006)	Impact of Gender and Ethnic Composition of South African Boards of Directors on Intellectual Capital Performance	- The percentage of female directors on board of directors	The result showed the percentage of female directors on board of directors has a significant positive relationship with intellectual capital performance.
Swartz & Firer (2005)	Board Structure and Intellectual Capital Performance in South Africa	The percentage of women on the board of directors	The result showed the percentage of women on the board of directors is not significant.
Angaye et al. (2004)	Board Structure and Value Added Performance in Nigeria	- Board size - The percentage of outside directors on the Boards - The number of females on Boards - The separation of the roles of Chief Executive Officer and Chair of Board of Directors	The result showed the positive associations between the numbers of female whereas board size, the separation of the roles of Chief Executive Officer and Chair of Board of Directors, and the percentage of outside directors on the boards is not significant.

Table 2.1 Summary of the literature relating board of directors and intellectual capital efficiency (Cont.)

Author	Title	Independent Variable	Key Findings
Ho & Williams (2003)	International Comparative Analysis of the Association between Board Structure and the Efficiency of Value Added	- Percentage of outside directors on the board - Duality - Board size	The result showed the percentage of outside directors on the board is significant while the duality and board size is not significant.

Table 2.2 Summary of the literature relating board of director characteristics and firm performance

Author	Title	Independent Variable	Key Findings
Jermias & Gani (2014)	The Impact of Board Capital and Board Characteristics on Firm Performance	- CEO duality - Board independence	They predict and find that CEO duality and board dependence negatively affect performance and that board capital mitigates the negative effects.
Leung, Richardson, & Jaggi (2014)	Corporate Board and Board Committee Independence, Firm Performance, and Family Ownership Concentration: An Analysis based on Hong Kong Firms	- Board independence	They findings show that the proportion of independent directors on the corporate boards of family firms is lower than that of non-family firms, but they find no significant difference in the representation of independent directors on the key committees of corporate boards between family and non-family firms.

Table 2.2 Summary of the literature relating board of director characteristics and firm performance (Cont.)

Author	Title	Independent Variable	Key Findings
Connelly, Limpaphayom, & Nagarajan (2012)	Form versus Substance: The Effect of Ownership Structure and Corporate Governance on Firm Value in Thailand	- Board size - Board independence	The study showed that the value benefits of complying with "good" corporate governance practices are nullified in the presence of pyramidal ownership structures, raising doubts on the effectiveness of governance measures when ownership structures are not transparent. The researchers concluded that family control of firms through pyramidal ownership structures can allow firms to seemingly comply with preferred governance practices but also use the control to their advantage.
Abdullah, Ismail, & Nachum (2012)	Women on Boards of Malaysian Firms: Impact on Market and Accounting Performance	- Proportion of women - Women's presence - Board independence - Board size	The empirical analysis was based on a dataset of 841 publicly-listed firms in Malaysia. The results showed a positive impact of women's participation on accounting-performance and a negative impact on market performance.

Table 2.2 Summary of the literature relating board of director characteristics and firm performance (Cont.)

Author	Title	Independent Variable	Key Findings
Lam & Lee (2008)	CEO Duality and Firm Performance: Evidence from Hong Kong	- CEO Duality	The empirical evidence suggested that the relationship between CEO duality and accounting performance is contingent on the presence of the family control factor. CEO duality is good for non-family firms while non-duality is good for family-controlled firms.
Chen, Lin, & Yi, (2008)	CEO Duality and Firm Performance: An Endogenous Issue.	- CEO Duality	CEO-duality significantly affects firm performance. The researchers found a relatively high percentage of independent directors in dual CEO firms.

Table 2.2 Summary of the literature relating board of director characteristics and firm performance (Cont.)

Author	Title	Independent Variable	Key Findings
Vafeas (1999)	Board Meeting Frequency and Firm Performance	- Board meeting - Board size - Size of Audit committees	For 307 firms over the 1990-1994 periods, the researcher found that board meeting frequency is related to corporate governance that is consistent with contracting and agency theory. The annual number of board meetings is inversely related to firm performance. This result is driven by increases in board activity following share price declines. The results suggested that board activity, measured by board meeting frequency, is an important dimension of board operations.

Table 2.3 Summary of the literature relating intellectual capital efficiency and firm performance

Author	Title	Independent Variable	Key Findings
Nimtrakoon (2014)	The Relationship between Intellectual Capital, Firms' Market Value, and Financial Performance	VAIC™ is a composite sum of three indicators of physical capital employed efficiency (CEE), human capital efficiency (HCE), and structural capital efficiency (SCE).	The purpose of this research was to explore the extent of intellectual capital among Asian countries and examine the relationship between firms' intellectual capital and financial performance. The study used the data of 220 technology firms listed on five Asian stock exchanges of year 2011 using Pulic's Value Added Intellectual Coefficient (VAIC^{TM}) model. The results revealed that there is no significant difference in VAIC^{TM} across five Asian countries. The results further indicated a positive relationship between intellectual capital and stock market value, confirming that firms with greater intellectual capital tend to have no association with ROE.

Table 2.3 Summary of the literature relating intellectual capital efficiency and firm performance (Cont.)

Author	Title	Independent Variable	Key Findings
Berzkalne & Zelgalve (2014)	Intellectual Capital and Company Value	VAIC™ is a composite sum of three indicators of physical capital employed efficiency (CEE), human capital efficiency (HCE) and structural capital efficiency (SCE).	The study showed that an increase in intellectual capital should increase the value of the company. Empirical results by other authors are inconsistent, and this study obtained mixed results as well. There is a statistically significant and positive relationship between intellectual capital and the company value for enterprises in Latvia and Lithuania whereas such correlation was not observed for companies in Estonia.
Muhamma & Ismail (2014)	Intellectual Capital Efficiency and Firm's Performance: Study on Malaysian Financial Sectors	VAIC™	The study showed that intellectual capital has significant and positive relationships with the company's performance measured by profitability and return on assets (ROA).

Table 2.3 Summary of the literature relating intellectual capital efficiency and firm performance (Cont.)

Author	Title	Independent Variable	Key Findings
Fathi et al. (2013)	Impact of Intellectual Capital on Financial Performance	VAIC™ is a composite sum of three indicators of physical capital employed efficiency (CEE), human capital efficiency (HCE), and structural capital efficiency (SCE).	There is significant positive relationship between firm performance and value added efficiency of structural capital component with the financial performance measures by ROE. Moreover, the results indicated that there is significant positive relationship between value added efficiency of capital employed and value added efficiency of human capital with ROE.
Dadashinasab (2012)	The Effect of Intellectual Capital on Performance: A Study among Iranian Automotive Industry	VAIC™ is a composite sum of three indicators of physical capital employed efficiency (CEE), human capital efficiency (HCE), and structural capital efficiency (SCE).	The findings of this current study demonstrated that firms' intellectual capital has a positive impact on financial performance, and the components of VAIC (VACA, VAHU, and STVA) are positively and significantly influenced on ROA, ROE and GR.

Table 2.3 Summary of the literature relating intellectual capital efficiency and firm performance (Cont.)

Author	Title	Independent Variable	Key Findings
Clarke et al. (2011)	Intellectual Capital and Firm Performance in Australia	VAIC™ is a composite sum of three indicators of physical capital employed efficiency (CEE), human capital efficiency (HCE), and structural capital efficiency (SCE).	The results suggested that there is a direct relationship between VAIC and performance of Australian publicly listed firms, particularly with CEE and to a lesser extent with HCE. A positive relationship between HCE and SCE in the prior year and performance in the current year is also found.
Rehman et al. (2011)	Intellectual Capital Performance and Its Impact on Corporate Performance: An Empirical Evidence from Modaraba Sector of Pakistan	VAIC™ is a composite sum of three indicators of physical capital employed efficiency (CEE), human capital efficiency (HCE), and structural capital efficiency (SCE).	The results showed that HCE has a significant relationship with financial performance (ROE), and SCE also has a significant relationship with financial performance (ROE) whereas CEE has a substantive effect with ROE.

Table 2.3 Summary of the literature relating intellectual capital efficiency and firm performance (Cont.)

Author	Title	Independent Variable	Key Findings
Gan & Saleh (2008)	Intellectual Capital and Corporate Performance of Technology-Intensive Companies: Malaysia Evidence	- Intellectual capital performance by VAIC	The results indicated that physical capital efficiency is the most significant variable related to profitability while human capital efficiency is a great importance in enhancing the productivity of the company. This study concluded that VAIC can explain profitability and productivity but fails to explain market valuation.
Chen, Cheng, & Hwang (2005)	An Empirical Investigation of the Relationship between Intellectual Capital and Firms' Market Value and Financial Performance	- Intellectual capital performance by VAIC	The results supported the hypothesis that firms' intellectual capital has a positive impact on market value and financial performance and may be an indicator for future financial performance.

CHAPTER 3
RESEARCH METHODOLOGY

This chapter presented the research methods which were organized as follows. First of all, conceptual model framework was instructed by literature review. Second, research design included the population and sample selections. Third, measurement variables included the measurement dependent variables, moderating variables, independent variables, and control variables. Finally, data analysis was done by using descriptive statistics, reliability analysis, correlation analysis, partial least squares, measurement model, and research model.

3.1 Conceptual Model

According to the research framework and hypotheses in chapter one, this study used structural equation model (SEM) analysis. Thus, the statistical research model was created for hypothesis testing as follows:

The model was used to test that intellectual capital efficiency connects with firm performance and board of director characteristics measures by board size, audit committee size, board independent, women on board, CEO Duality, board meeting, and audit committee meeting. Further, it developed a structural equation model to show these connections based on the evidence that board of directors is responsible for developing intellectual capital efficiency and to achieve maximum efficiency from intellectual capital efficiency to gain higher firm performance. That is why board size, audit committee size, board independence, women on board, CEO duality, board meeting, and audit committee meeting have been taken as firm level corporate governance measures. Meanwhile, intellectual capital efficiency has been measured by VAIC methodology which provides standardized and straight forward measure to calculate and compare intellectual capital performance across various sectors at national and international level.

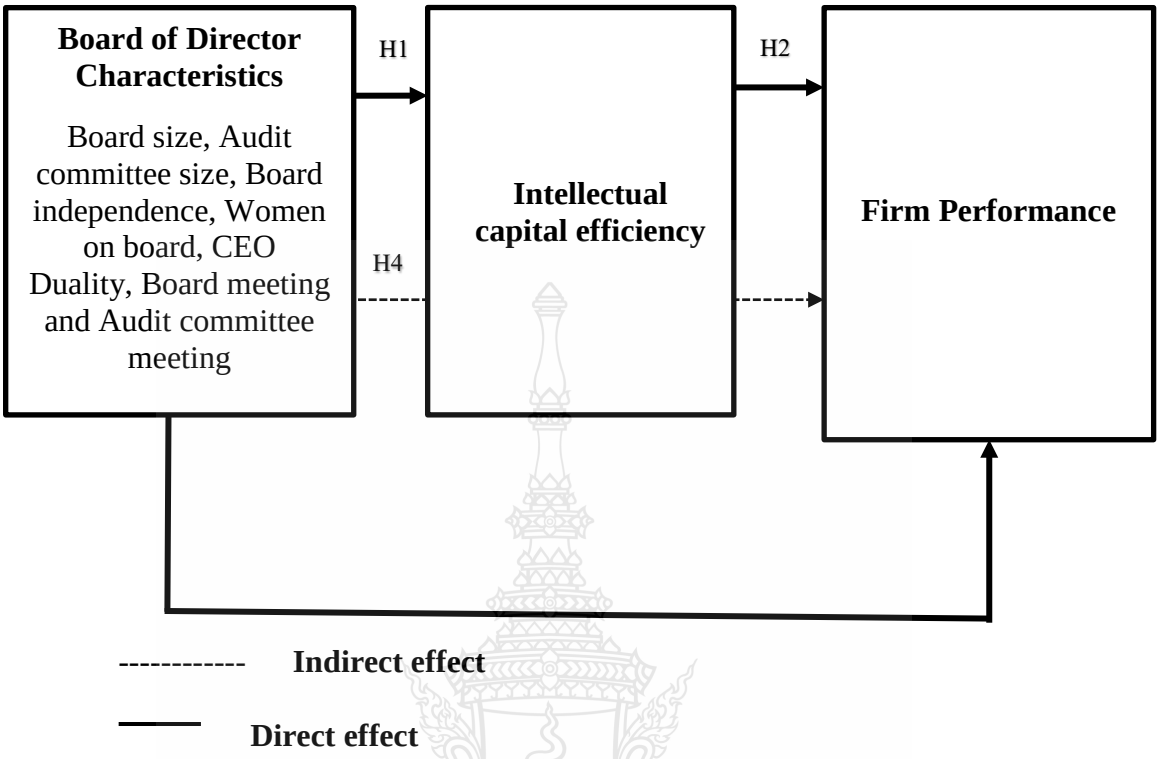

Figure 3.1 Conceptual Model

3.2 Research Design

This study was cross-sectional observed from population or research sample at one specific point of time. The methodology was divided into the quantitative research and the qualitative research. For the quantitative research, the secondary data from SETSMART were used as an instrument for data collection. The result from the survey showed the relationship of research framework. Meanwhile, the qualitative research was done through the in-depth interview with audit committees and board of directors in Thai listed companies. The data from the interview were used to comply with the result of the quantitative research.

3.2.1 Quantitative Methodology

3.2.1.1 Population and samples

The companied listed on the Stock Exchange of Thailand (SET) have been selected for the study by keeping in a view that most of the listed companies are big enough to acquire, develop, and exploit intellectual capital. Inclusive data on board

of directors, intellectual capital efficiency, and firm performance can be extracted from the annual reports of these publicly traded companies easily.

This study tried to draw structural links between board of directors, intellectual capital efficiency, and firm performance of listed companies on the Stock Exchange of Thailand (SET). The study examined 403 companies listed on the Stock Exchange of Thailand (SET) in 2014. The research was quantitative and based on collecting the 2014 data from SET Market Analysis and Reporting Tool (SETSMART) and the annual reports of the companies in 2014, which was the most recent year for which data were available at the time.

Total population based on SETSMART 545 was companies, and the unit of analysis included large companies which many stakeholders (investor, creditor, and shareholders) use accounting information for decision making which have an information asymmetry. The researcher selected samples size by using purposive random sampling method. Thus, the total of sample selection was about 73.95%% of the total number of listed companies at the end of the year.

A total of 58 companies in financial industries (banking, finance, and insurance) were excluded from the sample of the listed companies in the study since these firms have unique estimates and the nature of assets to be substantially different than in other industries (Klein, 2002; Yang & Krishnan, 2005). Furthermore, another 15 companies under rehabilitation were also excluded from the sample because the financial reporting requirements and characteristics of business operations differ from other companies.

Companies with fiscal year-ends not falling on December 31, 2014 were excluded from the sample. The December fiscal year end was used to ensure that the subjects in the study sample were subject to similar market conditions.

Table 3.1 presented the final study sample, comprising observations in 2014.

Table 3.1 Samples selection in 2014 (The Stock Exchange of Thailand, 2014)

Total Samples		**Firm**	**Percent**
Listed companies on the Stock Exchange of Thailand (SET) in 2014 from Fact Books and SETSMART		**554**	**100%**
Less:			
Companies Under Rehabilitation	15		
Financials	58		
Property Fund & Real Estate Investment Trust	53		
Missing Data	15		
Outlier data	10	**151**	**27.26%**
Final Samples		**403**	**72.74%**

There were 7 groups of population, so the sample size was specified into each group with good proportion. The proportion was computed from each group of Thai industrial presented in table 3.2.

Table 3.2 Classified industry of SET listed companies (The Stock Exchange of Thailand, 2014)

Industry	**Firms**	**Percent**
Agro & Food Industry	41	10.17
Consumer Products	38	9.43
Industrials	76	18.86
Property & Construction	85	21.09
Resources	32	7.94
Services	92	22.83
Technology	39	9.68
	403	**100.00**

3.2.1.2 Data collection

This study comprised both qualitative and quantitative research. Regarding the qualitative research, the data were derived from the in-depth interviews with audit committees and board of directors. For the quantitative research, secondary data were analyzed. The data from the financial reports of Thai listed companies, available on the SETSMART database, were used.

Other data were derived from the SET and the companies' own websites. In addition, the companies' financial reports could also be accessed from the Set Market Analysis and Reporting Tool (SETSMART), the web-based application from the SET.

Data collection was done from the report on the disclosure of additional information (Form 56-1) and the annual reports (Form 56-2) of all Thai limited companies on the SET. Each company reporting all variables in 2014 including dependent variables was measured firm performance by ROE, and intellectual capital was measured by VAIC^{TM}. Independent variables were measured based on seven proxy of board of director characteristics including board size, women on board, independent directors, CEO duality, and board meeting.

3.2.1.3 Measurement variables

1) Firm performance: Return on equity (ROE)

In agreement with the theory, the dependent variables were defined by firm performance. These measures have been extensively used in previous research on the value impact board of directors.

The Return on equity: ROE for measurement indicator on accounting performance followed Brugen et al. (2009), Woodcock and Whiting (2009), Chauhan and Amit (2014), and Dadashinasab et al. (2012).

$$\text{ROE} = \frac{\text{Net Income}}{\text{Shareholder's Equity}}$$

ROE measures organizations profitability by revealing how much profit a company generates with the money shareholders have invested (Maditinos et al., 2011).

2) The intellectual capital efficiency

The study applied Value Added Intellectual Coefficient ($VAIC^{TM}$) introduced by Pulic (2000) measurement of intellectual capital efficiency. It contains three components: human capital efficiency (HCE), structural capital efficiency (SCE), and capital employed efficiency (CEE). $VAIC^{TM}$ (Muhammad & Ismail, 2014) was as follows.

Capital employed efficiency (CEE) = value added (VA)/capital employed (CE)

Human capital efficiency (HCE) = value added (VA)/human capital (HC)

Structural capital efficiency (SCE) = structural capital (SC)/value added (VA)

Value added intellectual coefficient ($VAIC^{TM}$) = HCE + SCE + CEE

Where:

HCE = Human capital efficiency

SCE = Structural capital efficiency

CEE = Capital employed efficiency

$VAIC^{TM}$ is widely used in analysis of intellectual capital.(Muhammad & Ismail, 2014; Pastuszak et al., 2013; Clarke et al., 2011; Joshi et al., 2013; Kweh, Chan, & Ting, 2013; Darabi, Kamran, & Ghadiri, 2012; Venugopal & Subha, 2012; Komnenic & Pokrajcic, 2012; Saengchan, 2008; Nimtrakoon, 2014).

3) Board of director characteristics

This study consisted of board of directors which was used as independent variables. The measure of each construct depended on its definition which was shown in details in table 3.3.

Table 3.3 Summary of definitions of variables

Symbol	Expect Sign*	Definition	Measurement
Independent Variables			
LOGBSIZE	+	The size of board of directors	Natural logarithm of total number of board of directors at the end of year
LOGACSIZE	+	The size of audit committees	Natural logarithm of total number of audit committees at the end of year
PerBIND	+	The proportion of independent directors	Proportion of the number of independent directors to the board size at the end of year.
PerWOMEN	+	The proportion of women on boards	Proportion of the number of women directors to the board size at the end of year.
LOGBMEET	+	The frequency of board meetings	Natural logarithm of total of board meetings in the year.
LOGACMEET	+	The frequency of audit committee meetings	Natural logarithm of total of audit committee meetings in the year.
BCEODUAL	+	The firm with a separate chairman and CEO	This is a dummy variable which takes the value of 1 if there are different people occupying the two positions of CEO and board chairman, and 0 if the CEO combines as the board chairman.

* On VAIC , ROE

4) Control variables

Control variables can explain and estimate the level of intellectual disclosure. In this case, control variables were selected based on prior disclosure studies (Chau & Gray, 2002; Chen & Jaggi, 2000; Eng & Mak, 2003; Ferguson et al., 2002; Gul & Leung, 2004; Wallace & Naser, 1995). The variables were divided into 3 variables including auditor status, firm age, and industry type**.**

Table 3.4 Control variables in the study

Symbol	**Definition**	**Measurement**
BIG4	Auditor status	A dummy variable that equals 1 if the firm is audited by a Big 4 (PricewaterhouseCoopers, Ernst & Young, Deloitte & Touche, and KPMG) accounting firm, 0 otherwise;
FIRMAGE	Firm age	Firm age is defined as the number of years it has been active in the listed date in the market place, which age differences may lead to difference in operating size, knowhow, innovation, and knowledge.
INDUSTRY	Industry type	It uses dummy variables to indicate a firm's industry membership based on industry group classification into two groups: manufacturing and service.

3.3 Data Analysis

3.3.1 Descriptive Statistics

Descriptive statistics consisted of minimum, maximum, mean, frequency, and standard deviation which were applied for data generalization in all variables. Independent variables included women on board, board size, CEO duality, and independent directors. Meanwhile, board meeting mediator variables were Value Added Intellectual Coefficient (VAIC), capital employed efficiency, structural capital

efficiency, and human capital efficiency whereas dependent variable was return on equity (ROE).

1) Mean or average is probably the most commonly used method of describing the central tendency. To compute the mean, it is to add up all the values and then divide by the number of values.

2) Median is the score found at the exact middle of the set of values. One way to compute the median is to list all scores in numerical order and then locate the score in the center of the sample.

3) Standard deviation is a more accurate and detailed estimate of dispersion because an outlier can greatly exaggerate the range. In statistics and probability theory, the standard deviation (SD) measures the amount of variation or dispersion from the average. A low standard deviation indicates that the data points tend to be very close to the mean (also called expected value). A high standard deviation indicates that the data points are spread out over a large range of values. The standard deviation of a random variable, statistical population, data set, or probability distribution is the square root of its variance. It is algebraically simpler though in practice less robust than the average absolute deviation. A useful property of the standard deviation is that, unlike the variance, it is expressed in the same units as the data. For measurements with percentage as the unit, however, it is noted that the standard deviation will have percentage points as the unit. In addition to expressing the variability of a population, the standard deviation is commonly used to measure confidence in statistical conclusions.

4) Normality of the error term distributions

Normal distribution is the benchmark for statistical methods. If the variation from the normal distribution is sufficiently large, all results in statistical tests are invalid because normality is required to use the F and t – statistic (Hair et al. 2010). The shape of any distribution can be described by kurtosis and skewness. Kurtosis refers to the distribution compared with normal distribution. Skewness is used to describe the balance of the distribution. The original data file should be screened for normality (Hair et al., 2010; Kline, 2011). Normal distribution can be described by the two measures of kurtosis and skewness. Kurtosis refers to the peak or flat of the distribution compared

with the normal distribution. Skewness is used to describe the balance of normal distribution. A positive skew denotes a distribution shift to the left whereas a negative skewness reflects a shift to the right. The skewness and kurtosis of a normal distribution are given values of zero. Thus, the values of the kurtosis and skewness in a normal distribution are equal to zero, otherwise its signs indicate the type of kurtosis as positive or negative. Kline (2011) suggested that an absolute value of the skew index greater than 3.0 shall be described as “extremely” skewed. A conservative rule of thumb is that the absolute values in the kurtosis index of greater than 10.0 may suggest a problem, and a value greater than 20 may indicate an even bigger one.

3.3.2 Correlation Analysis

Correlation analysis is applied in the relationships exploring among the independent variables, and it is to check on the multicollinearity presence. In this study, the researcher indicated about multicollinearity when the inter-correlation between the explanatory variables are over 0.80 (Hair et al., 2006). Thus, this problem takes place when a single independent variable is highly correlated with other independent variables set. If multicollinearity is higher, the interpretation of the variables will be more complicated since we can explain the variable by other variables in the analysis. Hence, factor analysis is applied for correlated variables grouping together to avoid from the problem of multicollinearity. This study applied Pearson correlation in inter-correlation relationship evaluation in each variable.

3.3.3 Structure Equation Modeling

The covariance development based on the structural equation modeling backward to the original chapters by Joreskog (1973) regarding a general approach to estimate the linear structural equation system. Wiley (1973) identified the structural equation models (SEM) problems with the unmeasured variables. The technique of SEM has allowed the researchers to simultaneously examine the series of relationships. Many of social, behavioral, and management sciences researchers opt to apply the method of SEM due to the availability of popular programs such as LISREL and AMOS with the need to minimize the sample covariance and the reproduces covariance matrix of observed measures. This is the reason that the researcher followed the normality and independence assumptions.

Path analysis refers to a kind of structural equation modeling (SEM) technique based on the path analysis originating regression. It is stated by the Cabrita and Bontis (2008) as the powerful social and behavioral sciences tool. The theories are formulated based on the hypothetical construct where theoretically it cannot be directly observed or measured. It is explained by Makki and Lodhi (2014) that primarily path analysis has intended on causal predictive analysis where the complex models and multiple sets of endogenous and exogenous indicators are involved, and it is useful for theory development. For example, the focuses of this study was to measure the board of director impact on the efficiency of intellectual capital rather than the board of directors direct impact on the financial performance on the conventional manner.

3.3.3.1 Model assessment (fitting)

The objective of model testing was to fit the sample data to the specified theoretical model. As a good model fit means that the specified model is supported by the sample data. In contrast, a poor model fit implies the need for respecified model to gain a fit since the theoretical model is not properly by the sample data. The following indices were used to check the consistency of the model with empirical data.χ^2 (Chi-square) or CMIN: Chi-square is a basis of measure of fit that is used in the calculation of measure other fit. The chi-square or CMIN must have $p > 0.05$. If CMIN/$df \leq 3$ that it will be cutoff due to good fitting models (Diamantopoulos & Siguaw, 2000; Kline, 2011).

1. GFI (Goodness of Fit Index): Schumacher and Lomax (2004) suggested that GFI should be greater than 0.90.

2. AGFI (Adjusted Goodness of Fit Index: Sharma (1996) suggested that AGFI should be greater than 0.90.

3. CFI (Comparative Fit Index): CFI should be greater than 0.90 (Kline, 2011).

4. NFI (Normed Fit Index) which is considered consistent should be greater than 0.90 (Byrne, 2013).

5. RMR (Root Mean Square Residual) which is considered good fit should be less than 0.08 (MacCullum, Browne, & Sugawara, 1996).

RMSEA (Root Mean Square Error of Approximation): The RMSEA is the most popular measure of model fit. Most of researchers suggested that RMSEA should be less than 0.08 (Schumaker & Lomax, 2004). If the RMSEA value is more than 0.10, it will be cutoff due to poor fitting models. It is shown in table 3.5 as follows.

Table 3.5 Goodness-of-fit indices

Goodness-of-fit indices			**Acceptable Level Value**
Chi-square/df (CMIN/df)	=	CMIN/df	Less than 3
P-value of Chi-square	=	*p-value*	> 0.05
Goodness of Fit Index	=	GFI	>0.90
Adjust Goodness of Fit Index	=	AGFI	>0.90
Comparative Fit Index	=	CFI	>0.90
Norm Fit Index	=	NFI	>0.90
Root Mean Square Error of Approximation	=	RMSEA	<0.08

3.3.3.2 Testing for mediation

In this study, the mediating intellectual capital efficiency on the effect between board of director characteristics and firm performance was examined. There are three main types of simple mediation: (1) full mediation, (2) partial meditation, and (3) direct effect. These types of mediation were shown in figure 3.2 below.

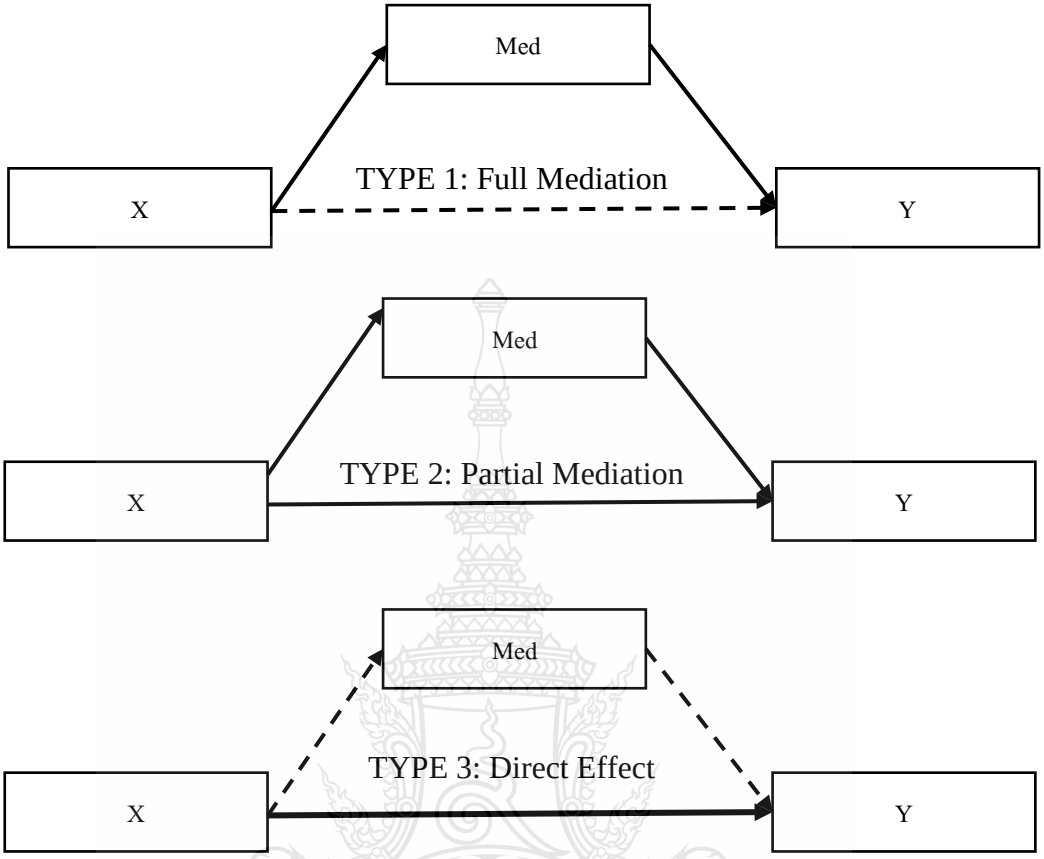

Figure 3.2 Full Mediating, Partial Mediating, and Direct Effect (No Mediating)

Partial mediation means that both the direct and indirect effects from the independent variables and dependent variables are significant. Full mediation means that the direct effect drops out of significance when the mediator is added and that the indirect effect significant. Indirect effect means that the direct effect never was significant but that the indirect effect is (Hair et al., 2009).

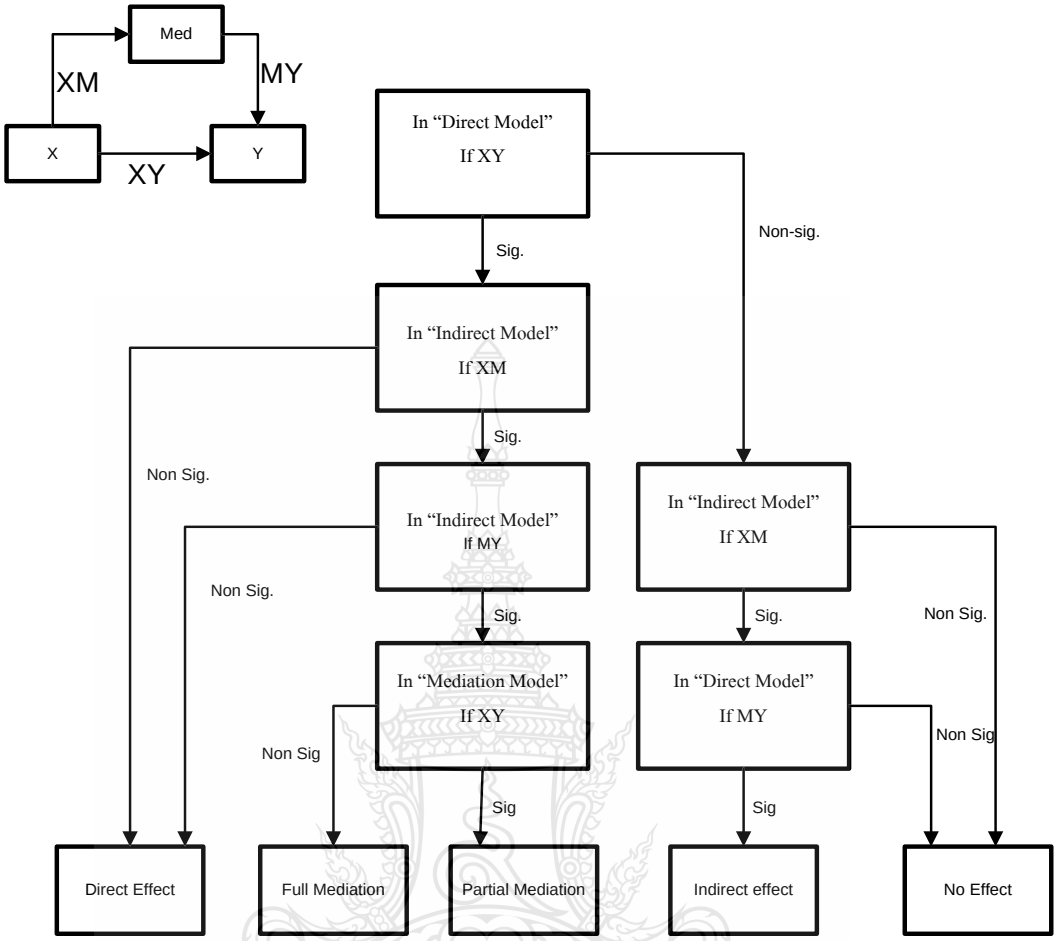

Figure 3.3 Decision Flow Chart for Evidence Supporting Different Intervening Effect (Adopted by Mathieu & Taylor, 2006; Naghavi et al., 2014)

Mathieu and Taylor (2006) and Naghavi et al. (2014) approach in the effect X→M-→Y addressed that "a hypothesis of full mediation is predicted on a significant total X→Y (βxy) relationship." Accordingly, figures 3.3 showed decision flow chart for evidence supporting different intervening effects. Further, the results of significance of indirect effects can be analyzed by using the bootstrap procedure in AMOS software or using the sobel test proposed by Sobel (1982). On the other hand, Mathieu and Taylor (2006) mentioned when the βXMY are significant, and the previous condition were satisfied, then the data are consistent with the hypothesis of full mediation." Meanwhile, in partial mediation hypothesis all three paths: X→M (βXM) and both X→Y (βXY) and

M→Y (βMY) are significant when considered simultaneously (Mathieu & Taylor, 2006). Furthermore, in the relationship X→M→Y, failing in the full mediation role, one might consider an alternative hypothesis of an indirect effect. In contrast, when the βXM and βMY are significant (Mathieu & Taylor, 2006), the data are consistent with the hypothesis of indirect effect.

3.3.2 Qualitative Methodology

The qualitative research was done through the in-depth interview with board of directors or audit committees to confirm the results of quantitative research.

3.3.2.1 Population and sample

The qualitative research populations were the same as the quantitative research. This step did not define the amount of research sample.

Research sample of interviewing was board of directors and audit committee who were responsible for business firms. There were seven questions as follows:

1. How does the number of board of directors affect intellectual capital efficiency and firm performance?

2. How does the number of audit committee affect intellectual capital efficiency and firm performance?

3. How does the proportion of independent directors affect intellectual capital efficiency and firm performance?

4. How does the proportion of women on boards affect intellectual capital efficiency and firm performance?

5. How does the frequency of board meetings affect intellectual capital efficiency and firm performance?

6. How does the frequency of audit committee meetings affect intellectual capital efficiency and firm performance?

7. How does the firm with a separate chairman and CEO affect intellectual capital efficiency and firm performance?

3.3.2.2 Research instrument

The questions asked were open-ended questions which gave the answers to explain without a control. The answers were phrased by statement responses. The questions of the in-depth interview were divided into 6 parts as follows:

1) Consent to participate

2) Open questions

3) Board of directors activity questions

4) Intellectual capital efficiency questions

5) Board of directors activity effect on intellectual capital efficiency questions

6) Ended questions

7) Gratefulness

CHAPTER 4
RESEARCH RESULT

This chapter presented the research result consisting of two sections. First, the result was a brief overview of the descriptive statistics of the variable. Second, the results of correlation analysis and hypotheses testing by using structural equation modeling by path analysis were discussed in details. Finally, the summary of all hypotheses testing was also provided.

4.1 Objectives of the Study

The main objectives of this study were to investigate the effect of intellectual capital linking board of director characteristics and firm performance: empirical evidence from Thai listed companies by classified as follows:

4.1.1 To investigate the effect of the seven characteristics of board of director characteristics (the size of board of directors, the size of audit committees, the proportion of independent directors, the proportion of women on board, the frequency of board meetings, the frequency of audit committee meetings, and the firm with a separate chairman and CEO) on intellectual capital efficiency of listed companies on the Stock Exchange of Thailand.

4.1.2 To investigate the effect of the seven characteristics of board of directors (the size of board of directors, the size of audit committees, the proportion of independent directors, the proportion of women on board, the frequency of board meetings, the frequency of audit committee meetings, and the firm with a separate chairman and CEO) on firm performance of listed companies on the Stock Exchange of Thailand.

4.1.3 To investigate the effect of intellectual capital efficiency on firm performance of listed companies on the Stock Exchange of Thailand.

4.1.4 To investigate the effect of intellectual capital efficiency linking board of director characteristics and firm performance of listed companies on the Stock Exchange of Thailand.

4.2 Data Preparation

4.2.1 The Population and Sampling

Total population based on SETSMART was 545 companies, and the unit of analysis included large companies which many stakeholders (investor, creditor, and shareholders) use accounting information for decision making which have an information asymmetry. The researcher selected the samples size by using probability random sampling by purposive random sampling method. In addition, a total of 58 companies in financial industries (banking, finance, and insurance) were excluded from the sample of the listed companies in the study since these firms have unique estimates and the nature of assets to be substantially different than in other industries (Klein, 2002; Yang & Krishnan, 2005).

Moreover, 53 companies with property fund and real estate investment were excluded from the sample of the listed companies in the study as these firms have financial statements different from other industries.

Furthermore, another 15 companies under rehabilitation were also excluded from the sample because the financial reporting requirements and characteristics of business operations differ from other companies.

Finally, the study examined 403 companies listed on the Stock Exchange of Thailand (SET) in 2014 on the rate of 73.95% of the total number of listed companies which were analyzed.

4.2.2 Treatment of the Missing Data

The researcher obtained a secondary data of each electronic/electrical industry by using the financial information from the Business Online Public Company Limited (BOL). However, the BOL database did not contain all of the electronic/electrical industry information, so the data could not be used in the experiment. Another reason why the research could not be completed was that some of the financial statements were missing between 2010 and 2012. Besides, the total of 25 companies' information such as the outlier values from a boxplot graph had been omitted. Therefore, only 180 companies were included in this analysis.

4.2.3 Normal Distribution of Samples

Before the statistical analysis was performed, the normal distribution of this sample was checked by using skewness and kurtosis value. Curran, West, and Finch (1996) suggested that if the absolute skewness index is more than 3, this means the data are asymmetric or do not have a normal distribution. If the absolute kurtosis index is more than 10, it indicates that there is no normal distribution. Besides, Vanichbuncha (2013) suggested that the skewness value should be between -1 and +1 to assume a normal distribution. In this study, the skewness value was between -0.193 to -0.942 whereas kurtosis value was between -0.655 to +1.711 as shown in table 4.3 and table 4.4. In summary, the data were normally distributed and could be analyzed through a structural equation model.

4.3 Descriptive Statistics and Correlation Matrixes of Variables

4.3.1 Descriptive Statistics

Descriptive statistics, including minimum, maximum, mean, median, mode, standard deviation, skewness, and kurtosis, were generated for each of the variables and included in the model as shown in the details in table 4.1 as follows.

Table 4.1 Descriptive statistics of variable (n = 403)

Symbol	Unit	Min	Max	Mean	Med.	Mode	Std.	Skew.	Kurt.
ROE	Ratio	-61.70	77.91	8.38	8.81	1.93	15.95	-0.14	4.33
VAIC	Value	-21.52	15.46	2.49	0.15	0.00	4.54	-0.33	3.59
BSIZE	Number	6.00	18.00	10.31	10.00	9.00	2.40	0.68	0.00
ACSIZE	Number	3.00	5.00	3.14	3.00	3.00	0.36	2.58	6.04
BIND	Number	3.00	9.00	4.04	4.00	3.00	1.18	1.49	2.70
BWOM	Number	0.00	7.00	1.75	1.00	1.00	1.50	1.03	1.08
BMEET	Frequency	4.00	24.00	7.50	6.00	4.00	3.77	1.44	2.14
ACMEET	Frequency	4.00	24.00	6.30	5.00	4.00	3.45	2.54	8.07
BCEODUAL	Dummy	0.00	1.00	0.63	1.00	1.00	0.48	-0.55	-1.70
LOGBSIZE	Log	0.78	1.26	1.00	1.00	0.95	0.10	0.18	-0.45
LOGACSIZE	Log	0.48	0.70	0.49	0.48	0.48	0.04	2.43	4.67

Table 4.1 Descriptive statistics of variable (n = 403) (Cont.)

Symbol	Unit	Min	Max	Mean	Med.	Mode	Std.	Skew.	Kurt.
PerBIND	Proportion	0.20	0.71	0.40	0.38	0.33	0.09	1.07	1.16
PerWOMEN	Proportion	0.00	0.67	0.17	0.13	0.00	0.15	0.85	0.15
LOGBMEET	Log	0.60	1.38	0.83	0.78	0.60	0.19	0.59	-0.61
LOGACMEET	Log	0.60	1.38	0.75	0.70	0.60	0.18	1.24	1.08
BIG4	Dummy	0.00	1.00	0.69	1.00	1.00	0.46	-0.84	-1.31
FIRMAGE	Years	1.00	39.00	17.60	20.00	20.00	8.78	0.11	-0.38
INDUSTR	Dummy	0.00	1.00	0.68	1.00	1.00	0.47	-0.76	-1.43

Where: LOGBSIZE = Total number of directors on the board, LOGACSIZE = Natural log of Board audit committees, PerBIND = The proportion of independent directors, PerWOMEN = The proportion of women on boards, LOGBMEET = The frequency of board meetings, LOGACMEET = The frequency of audit committee meetings, BCEODUAL = The firm with a separate chairman and CEO, VAIC = Intellectual capital efficiency, ROE = Return on Equity.

According to table 4.2, the result showed the descriptive results in 2014. The mean of firm performance (ROE) had an average value of 8.38, with the minimum of -61.70 and maximum of 77.91. The mean value for intellectual capital efficiency (VAIC) was estimated at 2.49 while its minimum and maximum values were -21.52 and 15.46, respectively. With respect to board of director characteristics, the mean and median of board size (BSIZE) were 10.31 and 10.00, respectively. Its minimum value was 6 persons, and the maximum was 10 persons. The mean and median of audit committee size (ACSIZE) were 10.31 and 10.00, respectively. Its minimum value was 6 persons, and the maximum was 10 persons. The mean and median of board independence (BIND) were 4.04 and 4.00, respectively. Its minimum value was 3 persons, and the maximum was 9 persons. The mean and median of audit committee size (BWOM) were 1.75 and 1.00, respectively. Its minimum value was zero, and the maximum was 7 persons. The mean and median of audit committee size (BMEET) were 7.50 and 6.00, respectively. Its minimum value was 4 times, and the maximum was 24 times. The mean and median of audit committee size (ACMEET) were 6.30 and 5.00, respectively. Its minimum value was 4 times, and the maximum was 24 times. The mean and median

of audit committee size (BCEODUAL) were 0.63 and 1.00, respectively. Its minimum value was zero, and the maximum was 1.

The mean natural logarithm of board size (LOGBSIZE) was 1.00 whereas its minimum value was 0.78, and the maximum was 1.26. The mean natural logarithm of audit committee size (LOGACSIZE) was 0.49 while its minimum value was 0.48, and the maximum was 0.70. The mean of proportion of board independence (PerBIND) was 0.40, with the minimum of 0.20, and the maximum of 0.71. The mean of percentage of women on board (PerWOMEN) was 0.17, with the minimum of 0.00, and maximum of 0.67. The mean natural logarithm of the frequency of board meeting (LOGBMEET) was 0.83. Its minimum value was 0.60, and the maximum was 1.38. The mean of frequency of audit committee meeting (LOGACMEET) was 0.75. Its minimum value was 0.60, and the maximum was 1.38. With respect to the control variables, the maximum type of audit firms (BIG4) was 1while its minimum value was zero. The mean of the BIG4 estimated was 0.69. The maximum of industry type (INDUSTRY) was 1 while its minimum value was zero. The mean of the industry estimated was 0.68. The maximum firm age (FIRMAGE) was 39 years while its minimum value was 1, and the mean of the age estimated was 17.60.

4.3.2 Correlations Matrix

Due to the Pearson correlations between the dependent and explanatory variables in table 4.3, the results showed that audit committee meetings had a positive correlation with firm performance. In contrast, board independence, board meeting, and CEO duality had negative correlation with firm performance. In addition, audit committee meetings had a positive correlation with intellectual capital efficiency. A statistical significance level of 0.05 was denoted by ***, **, and *, respectively. The result was shown in table 4.3.

Table 4.2 Correlation matrix

	LOG BSIZE	LOG ACSIZE	Per BIND	Per WOMEN	LOG BMEET	LOG ACMEET	BCEO DUAL	VAIC	ROE	BIG4	FIRM AGE	INDUSTRY
LOGBSIZE	1											
LOGACSIZE	.277**	1										
PerBIND	-.241**	.036	1									
PerWOMEN	-.105*	.034	-.056	1								
LOGBMEET	.089	.002	.140**	.016	1							
LOGACMEET	.140**	.086	.139**	-.025	.524**	1						
BCEODUAL	.034	-.081	-.010	-.054	-.014	-.095	1					
VAIC	.091	-.047	.011	-.052	.032	.139**	-.034	1				
ROE	.039	-.029	-.107*	.052	-.114*	.136**	-.113*	.419**	1			
BIG4	.147**	.002	-.091	-.139**	-.012	.051	-.006	.063	.163**	1		
AGE	.219**	.049	-.097	-.009	.102*	.032	-.073	-.007	-.027	.018	1	
INDUSTRY	-.147**	-.060	.141**	-.077	.006	.030	-.063	.068	.034	.023	-.150**	1

* = *p*-value < 0.05; ** = *p*-value < 0.01; *** = *p*-value < 0.001

4.4 Structural Equation Modeling Analysis

4.4.1 Classifications of Model

Table 4.3 Classifications of model

Hypothesis	Exogenous Variable	Mediator Variable	Endogenous Variable
1	Board of directors characteristics	-	The intellectual capital efficiency
2	Board of directors characteristics	-	Firm performance
3	The intellectual capital efficiency	-	Firm performance
4	Board of directors characteristics	The intellectual capital efficiency	Firm performance

4.4.2 Empirical Assessment of Proposed Models

The aim of this study was to investigate the effect of board of director characteristics and firm financial performance through intellectual capital efficiency. Board of director characteristics was an exogenous variable that consisted of the size of the board of directors (LOGBSIZE), board committees (LOGACSIZE), the proportion of independent directors (PerIND), the proportion of women on boards (PerWON), the frequency of board meetings (LOGBMEET), the frequency of Audit committee meetings (LOGACMEET), and the firm with a separate chairman and CEO (BCEODUAL). The intellectual capital efficiency (VAIC) was the mediator variable, and return on equity (ROE) was an endogenous variable whereas firm age (FIRMAGE), industry (INDUSTRY), and Big 4 were control variables as shown in figure 4.1

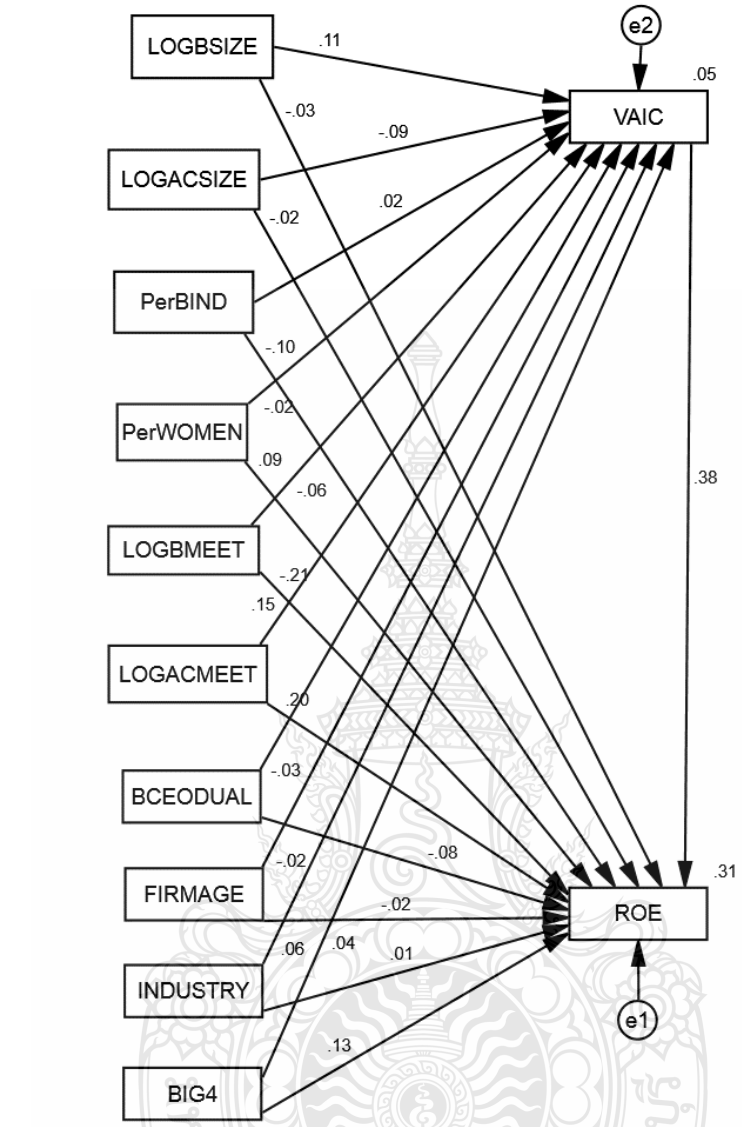

Figure 4.1 Structural Model of Investigation: Model of the Effect of Intellectual Capital Efficiency Linking Board of Director Characteristics and Firm Performance before Modification Indices.

According to figure 4.1, it showed the model fit of the effect of the intellectual capital efficiency linking on board of director characteristics and firm performance was not fitting with the empirical data. When the CMIN/df was 6.880, p-value of Chi-square was 0.000, GFI was 0.892, AGFI was 0.812, CFI was 0.311, NFI was 0.312, and RMSEA was 0.121 certain values were inappropriate the result was shown in table 4.5

Table 4.4 Comparison of goodness-of-fit index of proposed model

Index	**The Cutoff Point**	**Proposed Model**	**Accept**
CMIN/df	Less than 3	6.880	No
p-value	> 0.05	0.000	No
GFI	> 0.90	0.892	No
AGFI	> 0.90	0.812	No
CFI	> 0.90	0.311	No
NFI	> 0.90	0.312	No
RMSEA	< 0.08	0.121	No

From the result shown in table 4.5, the researcher adjusted the model (model modification) based on the parameters of model modification indices (MI) to the model fit with the empirical data, and the result was shown in figure 4.2.

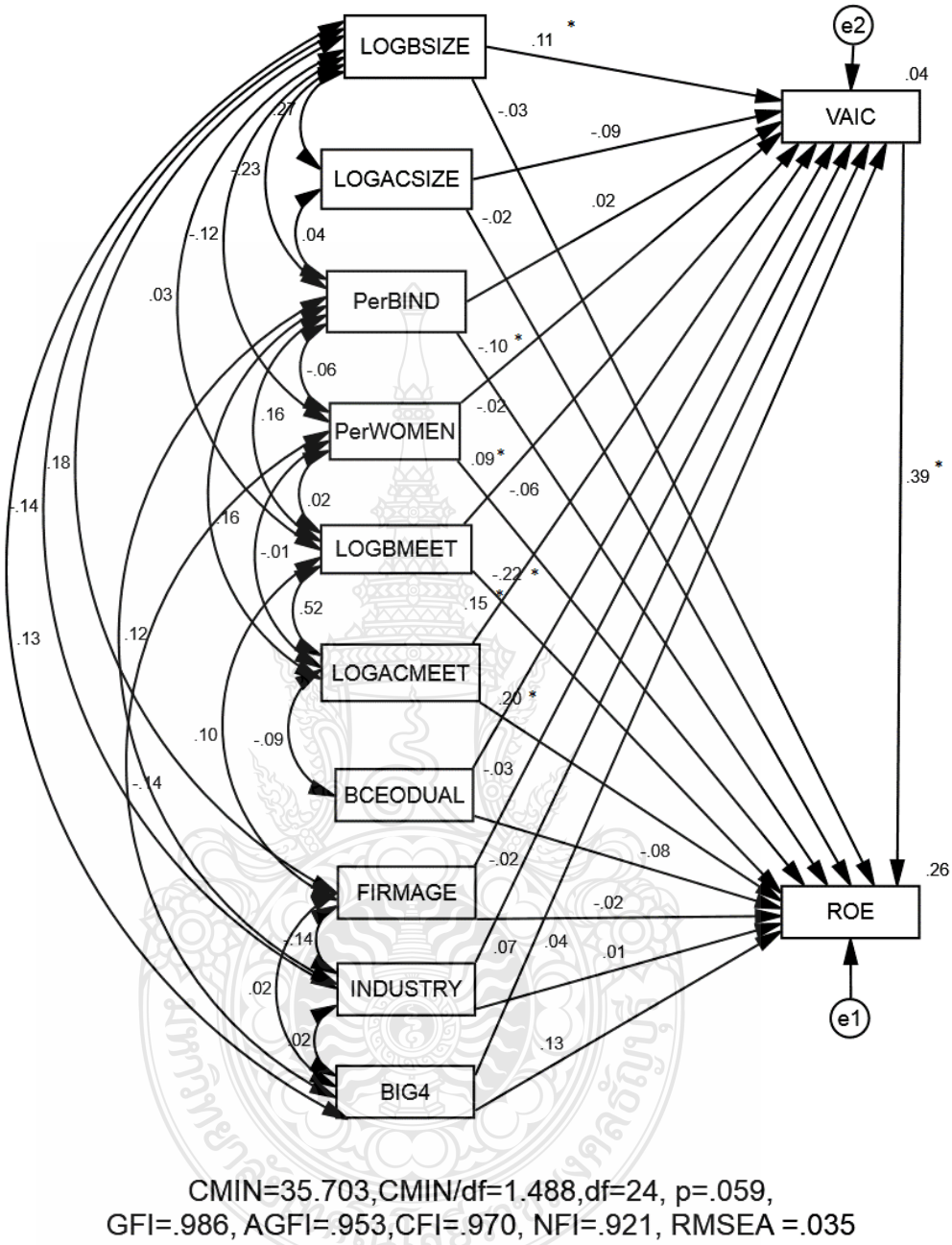

Figure 4.2 Structural Model of Investigation: Model of the Effect of Intellectual Capital Efficiency Linking Board of Director Characteristics and Firm Performance for Hypothesis Testing

According figure 4.2, it showed the model fit of the effect of intellectual capital efficiency linking board of director characteristics and firm performance. This study revealed that the models were combined with empirical data. When the CMIN/df was 1.488, and *p*-value of Chi-square was 0.059. GFI was 0.986, and AGFI was 0.953 while CFI was 0.970, and NFI was 0.921. Finally, RMR was 0.325, and RMSEA was 0.035. Therefore, the model fit for hypotheses testing was explained in table 4.6 as follows.

Table 4.5 Comparison of goodness-of-fit index of proposed model

Index	**The Cutoff Point**	**Proposed Model**	**Accept**
CMIN/df	Less than 3	1.488	Yes
p-value	> 0.05	0.059	No
GFI	> 0.90	0.892	Yes
AGFI	> 0.90	0.953	Yes
CFI	> 0.90	0.970	Yes
NFI	> 0.90	0.921	Yes
RMSEA	< 0.08	0.035	Yes

.

According to the hypotheses, board of director characteristics has performed as an exogenous while intellectual capital efficiency has performed as a mediator, and return on equity (ROE) has performed an endogenous variable. To test the hypotheses, there are some values required to be understood. These values are such as *t*-test value at the significance value at **p*-value < 0.05, ***p*-value < 0.01, ****p*-value < 0.001, and critical value (C.R.) (Arbuckle, 2011) as shown in table 4.7.

Table 4.6 Parameter estimation and the significant test for the effect of intellectual capital efficiency linking board of director characteristics and firm performance

			Regression Weight					Standardized Regression Weight
			Estimate	S.E.	C.R.	*P*		
VAIC	<---	LOGBSIZE	5.101	2.542	2.007	0.045	*	0.105
VAIC	<---	LOGACSIZE	-8.966	5.206	-1.722	0.085		-0.087
VAIC	<---	PerIND	0.996	2.741	0.363	0.716		0.025
VAIC	<---	PerWOM	-0.707	1.523	-0.464	0.642		-0.020
VAIC	<---	LOGBMEET	-1.363	1.367	-0.997	0.319		-0.059
VAIC	<---	LOGACMEET	3.847	1.462	2.631	0.009	*	0.152
VAIC	<---	BCEODUAL	-0.271	0.462	-0.586	0.558		-0.028
VAIC	<---	BIG4	0.349	0.488	0.715	0.475		0.037
VAIC	<---	INDUSTRY	0.632	0.484	1.305	0.192		0.064
VAIC	<---	FIRMAGE	-0.009	0.026	-0.345	0.730		-0.016
ROE	<---	VAIC	1.381	0.154	8.985	0.000	*	0.394
ROE	<---	LOGBSIZE	-4.318	7.875	-.548	0.583		-0.027
ROE	<---	LOGACSIZE	-8.863	16.109	-.550	0.582		-0.025
ROE	<---	PerBIND	-18.786	8.451	-2.223	0.026	*	-0.103
ROE	<---	PerWOMEN	9.409	4.696	2.004	0.045	*	0.087
ROE	<---	LOGBMEET	-17.885	4.218	-4.240	0.000	*	-0.217
ROE	<---	LOGACMEET	18.051	4.547	3.970	0.000	*	0.204
ROE	<---	BCEODUAL	-2.663	1.424	-1.870	.061		-0.081
ROE	<---	FIRMAGE	-0.032	.080	-0.399	.690		-0.018
ROE	<---	BIG4	4.574	1.505	3.039	.002	*	0.133
ROE	<---	INDUSTRY	0.246	1.497	0.164	.869		0.007

* = *p*-value < 0.05

4.5 Hypotheses Testing and Results

The results of hypotheses testing were discussed as follows.

4.5.1 The Result of Hypothesis 1

Research Question 1: Are there any direct effects of board of director characteristics on intellectual capital efficiency of listed companies on the Stock Exchange of Thailand?

Research Hypothesis 1: The board of director characteristics (the size of board of directors, the size of audit committees, the proportion of independent directors, the proportion of women on board, the frequency of board meetings, the frequency of audit committee meetings, and the firm with a separate chairman and CEO) has an effect on the intellectual capital efficiency.

H1a: The size of board of directors (LOGBSIZE) has a positive effect on intellectual capital efficiency.

According table 4.7, the results about board of director characteristics, intellectual capital efficiency, and firm performance showed that the size of board of directors had a positive effect on intellectual capital efficiency. The result indicated that the value of *t*-test revealed the estimated value of 5.101, standard error (S.E.) of 2.542, critical ratio (C.R.) of 2.007, and *p*-value of $0.045 < 0.05$. Therefore, it indicated that the size of board of directors was significant at a significance level of 0.05. It could be concluded that H1a was supported. Thus, the size of board of directors had a positive effect on intellectual capital efficiency.

H1b: The size of audit committees (LOGACSIZE) has a positive effect on intellectual capital efficiency.

According table 4.7, the results about audit committees, intellectual capital efficiency, and firm performance showed that the size of audit committees had no significant effect on intellectual capital efficiency. The result showed that the value of *t*-test revealed the estimated value of -8.966, standard error (S.E.) of 5.206, critical ratio (C.R.) of -1.722, and *p*-value of $0.085 > 0.05$. Therefore, it indicated that the size of audit committees was not significant at a significance level of 0.05. It could be concluded that H1b was not supported. Thus, the size of audit committees had no effect on intellectual capital efficiency.

H1c: The proportion of independent directors (PerBIND) has a positive effect on intellectual capital efficiency.

According table 4.7, the results about the proportion of independent directors, intellectual capital efficiency, and firm performance showed that the proportion of independent directors had no significant effect on intellectual capital efficiency. The result showed that the value of *t*-test revealed the estimated value of 0.996, standard error (S.E.) of 2.741, critical ratio (C.R.) of 0.363, and *p*-value of 0.716 > 0.05. Therefore, it indicated that the proportion of independent directors was not significant at a significance level of 0.05. It could be concluded that H1c was not supported. Thus, the proportion of independent directors had no effect on intellectual capital efficiency.

H1d: The proportion of women on boards (PerWOMEN) has a positive effect on intellectual capital efficiency.

According table 4.7, the results about board of director characteristics, intellectual capital efficiency, and firm performance showed that the proportion of women on boards had no significant effect on intellectual capital efficiency. The result showed that the value of *t*-test revealed the estimated value of -0.707, standard error (S.E.) of 1.523, critical ratio (C.R.) of -0.464, and *p*-value of 0.642 > 0.05. Therefore, it indicated that the proportion of women on boards did not significantly affect intellectual capital efficiency at a significance level of 0.05. It could be concluded that H1d was not supported. Thus, the proportion of women on boards had no effect on intellectual capital efficiency.

H1e: The frequency of board meetings (LOGBMEET) has a positive effect on intellectual capital efficiency.

According table 4.7, the results about board of director characteristics, intellectual capital efficiency, and firm performance showed that the frequency of board meetings had no significant effect on intellectual capital efficiency (VAIC). The result showed that the value of *t*-test revealed the estimated value of -1.363, standard error (S.E.) of 1.367, critical ratio (C.R.) of -0.997, and *p*-value of 0.319 > 0.05. Therefore, it indicated that the frequency of board meetings did not significantly affect intellectual capital efficiency at a significance level of 0.05. It could be concluded that H1e was not

supported. Thus, the frequency of board meetings had no effect on intellectual capital efficiency.

H1f: The frequency of audit committee meetings (LOGACMEET) has a positive effect on intellectual capital efficiency.

According table 4.7, the results about board of director characteristics, intellectual capital efficiency, and firm performance showed that the frequency of audit committee meetings had a positive effect on intellectual capital efficiency. The result showed that the value of *t*-test revealed the estimated value of 3.847, standard error (S.E.) of 1.462, critical ratio (C.R.) of 2.631, and *p*-value of 0.009 < 0.05. Therefore, it indicated that the frequency of audit committee meetings was significant at a significance level of 0.05. It could be concluded that H1f was supported. Thus, the frequency of audit committee meetings had a positive effect on intellectual capital efficiency.

H1g: The firm with a separate chairman and CEO has a positive effect on intellectual capital efficiency.

According table 4.7, the results about board of director characteristics, intellectual capital efficiency, and firm performance showed that the firm with a separate chairman and CEO had no significant effect on intellectual capital efficiency (VAIC). The result showed that the value of *t*-test revealed he estimated value of -0.271, standard error (S.E.) of 0.462, critical ratio (C.R.) of -0.586, and *p*-value of 0.558 > 0.05. Therefore, it indicated that the firm with a separate chairman and CEO did not significantly affect intellectual capital efficiency at a significance level of 0.05. It could be concluded that H1g was not supported. Thus, the firm with a separate chairman and CEO had no effect on intellectual capital efficiency.

4.5.2 The Result of Hypothesis 2

Research Question 2: Are there any direct effects of board of director characteristics on firm performance of listed companies on the Stock Exchange of Thailand?

Research Hypothesis 2: The board of director characteristics (the size of board of directors (LOGBSIZE), the size of audit committees (LOGACSIZE), the proportion of independent directors (PerBIND), the proportion of women on boards

(PerWOMEN), the frequency of board meetings (LOGBMEET), the frequency of audit committee meetings (LOGACMEET) and the firm with a separate chairman and CEO (BCEODUAL) has a positive effect on firm performance measured by ROE.

H2a: The size of board of directors (LOGBSIZE) has a positive effect on firm performance.

According table 4.7, the results about board of director characteristics, intellectual capital efficiency, and firm performance showed that the size of board of directors had no significant effect on firm performance. The result showed that the value of *t*-test revealed the estimated value of -4.318, standard error (S.E.) of 7.875, critical ratio (C.R.) of -0.548, and *p*-value of 0.583 > 0.05. Therefore, it indicated that the size of board of directors was not significant at a significance level of 0.05. It could be concluded that H2a was not supported. Thus, the size of board of directors had no effect on firm performance.

H2b: The size of audit committees (LOGACSIZE) has a positive effect on firm performance.

According table 4.7, the results about board of director characteristics, intellectual capital efficiency, and firm performance showed that the size of audit committees had no significant effect on firm performance. The result showed that the value of *t*-test revealed the estimated value of -8.863, standard error (S.E.) of 16.109, critical ratio (C.R.) of -0.550, and *p*-value of 0.582 > 0.05. Therefore, it indicated that the size of audit committees was not significant at a significance level of 0.05. It could be concluded that H2b was not supported. Thus, the size of board of directors had no effect on firm performance.

H2c: The proportion of independent directors (PerBIND) has a positive effect on firm performance.

According table 4.7, the results about board of director characteristics, intellectual capital efficiency, and firm performance showed that the proportion of independent directors had a negative effect on firm performance. The result showed that the value of *t*-test revealed the estimated value of -18.786, standard error (S.E.) of 8.451, critical ratio (C.R.) of -2.223 and *p*-value of 0.026 < 0.05. Therefore, it indicated that the proportion of independent directors was not significant at a significance level of

0.05. It could be concluded that H2c was not supported. Thus, the proportion of independent directors had a negative effect on firm performance.

H2d: The proportion of women on boards (PerWOMEN) has a positive effect on firm performance.

According table 4.7, the results about board of director characteristics, intellectual capital efficiency, and firm performance showed that the proportion of women on boards had a positive effect on firm performance. The result showed that the value of *t*-test revealed the estimated value of 9.409, standard error (S.E.) of 4.696, critical ratio (C.R.) of 2.004, and *p*-value of 0.045 < 0.05. Therefore, it indicated that the proportion of women on boards was significant at a significance level of 0.05. It could be concluded that H2d was supported. Thus, the proportion of women on boards had a positive effect on firm performance.

H2e: The frequency of board meetings (LOGBMEET) has a positive effect on firm performance.

According table 4.7, the results about board of director characteristics, intellectual capital efficiency, and firm performance showed that the frequency of board meetings (LOGBMEET) had a negative effect on firm performance. The result showed that the value of *t*-test revealed the estimated value -17.885, standard error (S.E.) of 4.218, critical ratio (C.R.) of -4.240, and *p*-value of 0.000 < 0.05. Therefore, it indicated that the frequency of board meetings was significant at a significance level of 0.05. It could be concluded that H2e was not supported. Thus, the frequency of board meetings had a negative effect on firm performance.

H2f: The frequency of audit committee meetings (LOGACMEET) has a positive effect on firm performance.

According table 4.7, the results about board of director characteristics, intellectual capital efficiency, and firm performance showed that the frequency of audit committee meetings had a negative effect on firm performance. The result showed that the value of *t*-test revealed the estimated value of 18.051, standard error (S.E.) of 4.547, critical ratio (C.R.) of 3.970 and *p*-value of 0.000 < 0.05. Therefore, it indicated that the frequency of frequency of audit committee meetings was significant at a significance

level of 0.05. It could be concluded that H2f was supported. Thus, the frequency of audit committee meetings had a positive effect on firm performance.

H2g: The firm with a separate chairman and CEO (BCEODUAL) has a positive effect on firm performance.

According table 4.7, the results about board of director characteristics, intellectual capital efficiency, and firm performance showed that the firm with a separate chairman and CEO had no significant effect on firm performance. The result showed that the value of *t*-test revealed the estimated value of -2.663, standard error (S.E.) of 1.424, critical ratio (C.R.) of -1.870, and *p*-value of 0.061 > 0.05. Therefore, it indicated that the firm with a separate chairman and CEO was not significant at a significance level of 0.05. It could be concluded that H2g was not supported. Thus, the firm with a separate chairman and CEO had no effect on firm performance.

4.5.3 The Result of Hypothesis 3

Research Question 3: Are there any direct effects of intellectual capital efficiency on firm performance of listed companies on the Stock Exchange of Thailand?

Research Hypothesis 3: Intellectual capital efficiency (VAIC) has a positive effect on firm performance.

According table 4.7, the results about board of director characteristics, intellectual capital efficiency, and firm performance showed that intellectual capital efficiency has a positive effect on firm performance. The result showed that the value of *t*-test revealed the estimated value of 1.381, standard error (S.E.) of 0.154, critical ratio (C.R.) of 8.985, and *p*-value of 0.000 < 0.05. Therefore, it indicated that intellectual capital efficiency was significant at a significance level of 0.05. It could be concluded that H3 was supported. Thus, intellectual capital efficiency has a positive effect on firm performance.

4.5.4 The Result of Hypothesis 4

Research Question 4: Is there any effect of board of director characteristics on firm performance through intellectual capital efficiency of listed companies on the Stock Exchange of Thailand?

Research Hypothesis 4: The board of director characteristics (the size of board of directors (LOGBSIZE), the size of audit committees (LOGACSIZE), the proportion

of independent directors (PerBIND), the proportion of women on boards (PerWOMEN), the frequency of board meetings (LOGBMEET), the frequency of audit committee meetings (LOGACMEET) and the firm with a separate chairman and CEO (BCEODUAL) has an indirect effect on firm performance through intellectual capital efficiency.

Table 4.7 Test intellectual capital efficiency as mediator between board of directors and firm performance

Direct Model						Indirect Model						Mediation Model						
IV on DV			β	p-value	sig	IV on DV			β	p-value	sig	IV on DV			β	p-value	sig	
LOGBSIZE	→	ROE	-4.318	0.583	No	LOGBSIZE	→	VAIC	5.101	0.045	Yes	LOGBSIZE	→	ROE	1.958	0.049	Yes	Full Mediation
						VAIC	→	ROE	1.381	0.000	Yes							
LOGACSIZE	→	ROE	-8.863	0.582	No	LOGACSIZE	→	VAIC	-8.966	0.085	No	LOGACSIZE	→	ROE	-1.691	0.091	No	No effects
						VAIC	→	ROE	1.381	0.000	Yes							
PerBIND	→	ROE	-18.786	0.026	Yes	PerBIND	→	VAIC	0.996	0.716	No	PerBIND	→	ROE	0.363	0.716	No	Direct effects
						VAIC	→	ROE	1.381	0.000	Yes							
PerBWOMEN	→	ROE	9.409	0.045	Yes	PerBWOMEN	→	VAIC	-0.707	0.642	No	PerBWOMEN	→	ROE	-0.463	0.643	No	Direct effects
						VAIC	→	ROE	1.381	0.000	Yes							
LOGBMEET	→	ROE	-17.885	0.000	Yes	LOGBMEET	→	VAIC	-1.363	0.319	No	LOGBMEET	→	ROE	-0.99	0.321	No	Direct effects
						VAIC	→	ROE	1.381	0.000	Yes							
LOGACMEET	→	ROE	18.051	0.000	Yes	LOGACMEET	→	VAIC	3.847	0.009	Yes	LOGACMEET	→	ROE	2.525	0.011	Yes	Partial Mediation
						VAIC	→	ROE	1.381	0.000	Yes							
BCEODUAL	→	ROE	-2.663	0.061	No	BCEODUAL	→	VAIC	-0.271	0.558	No	BCEODUAL	→	ROE	-0.585	0.558	No	No effects
						VAIC	→	ROE	1.381	0.000	Yes							

4.5.4.1 Partial or full mediation

In statistics, the Sobel test is also used for whether a mediator variable significantly carries the influence of an independent variable to a dependent variable (i.e., whether the indirect effect of the independent variable on the dependent variable through the mediator variable is significant). It is returned to both one-tailed and two-tailed probability values (Sobel, 1982). In other words, the Sobel test is a method of testing the significance of mediating effect (Sobel, 1982).

H4a: The size of board of directors (LOGBSIZE) has an indirect effect on firm performance through intellectual capital efficiency.

To examine the mediating effect of intellectual capital efficiency (VAIC), the structural equation model was carried out. Baron and Kenny (1986) stated that conditions should be met to establish the mediating effect of intellectual capital efficiency (VAIC) on the relationship between the size of board of directors (LOGBSIZE) and firm performance (ROE). The first structural equation model was performed to test the impact of the independent variables on the dependent variable, and the results of structural equation model indicated that the size of board of directors did not significantly affect firm performance (ROE). (β = -4.318, SE = 7.875, p = 0.583 > 0.05). Therefore, the first condition of mediation was not met. The second equation was estimated to test the impact of the independent variables on the mediating variable, and the result showed that the size of board of directors had a significant impact on intellectual capital efficiency (β = 5.101, SE = 2.542, p = 0.045 < 0.05). Thus, the second condition of mediation was met. The third condition of mediation was to explain the impact of the mediating variable on the dependent variable showing that intellectual capital efficiency (β = 1.381, SE = 0.154, p = 0.000 < 0.05) significantly affected firm performance. This met the third criterion. In summary, the regression result revealed that the first conditions were not achieved, but the second and third conditions of mediation test were achieved. The result of sobel test showed that the size of board of directors (LOGBSIZE) had a significant impact on intellectual capital efficiency (β = 2.151, p < 0.05). Consequently, intellectual capital efficiency did act as mediating variable in the relationship between board size and financial performance.

H4b: The size of audit committees (LOGACSIZE) has an indirect effect on firm performance through intellectual capital efficiency.

To examine the mediating effect of intellectual capital efficiency (VAIC), the structural equation model was carried out. The results of the structural equation model showed that the size of audit committees (LOGACSIZE) did not significantly affect firm performance (β = -8.863, SE = 0.16.109, p = 0.582 > 0.05). Therefore, the first condition of mediation was not met. The second structural equation was estimated to test the impact of the independent variables on the mediating variable, and it was found that the size of audit committees (LOGACSIZE) did not have a significant impact on intellectual capital efficiency (β = -8.966, SE = 5.206, p = 0.085 > 0.05). Thus, the

second condition of mediation was not met. The third condition of mediation was to explain the impact of the mediating variable on the dependent variable showing that intellectual capital efficiency (β = 1.381, SE = 0.154, p = 0.000 < 0.05) significantly affected firm performance. This met the third criterion. In summary, the result of sobel test revealed that the size of audit committees (LOGACSIZE) did not have a significant impact on intellectual capital efficiency (β = -2.131, p <0.05). Consequently, intellectual capital efficiency did not act as mediating variable in the relationship between board size and financial performance, so no relationship was considered.

H4c: The proportion of independent directors (PerBIND) has an indirect effect on firm performance through intellectual capital efficiency.

To examine the mediating effect of intellectual capital efficiency (VAIC), the structural equation model was carried out. The results of the structural equation model showed that the proportion of independence director (PerBIND) significantly affected firm performance (β = -18.786, SE = 8.451, p = 0.026 < 0.05). Therefore, the first condition of mediation was met. The second equation was estimated to test the impact of the independent variables on the mediating variable, and it was found the proportion of independence director (PerBIND) did not have a significant impact on intellectual capital efficiency (β = 0.996, SE = 5.206, p = 0.716 > 0.05). Thus, the second condition of mediation was not met. The third condition of mediation was to explain the impact of the mediating variable on the dependent variable showing that intellectual capital efficiency (β = 1.381, SE = 0.154, p = 0.000 < 0.05) significantly affected firm performance. This met the third criterion. The result of sobel test revealed that the proportion of independence director (PerBIND) had no significant impact on intellectual capital efficiency (β = 0.548, p > 0.05). Consequently, intellectual capital efficiency did not act as mediating variable in the relationship between the proportions of independence director (PerBIND) and financial performance, thus no relationship was considered.

H4d: The proportion of women on boards (PerWOMEN) has an indirect effect on firm performance through intellectual capital efficiency.

To examine the mediating effect of intellectual capital efficiency (VAIC), the structural equation model was carried out. The results of the structural equation model

showed that the proportion of women on boards (PerWOMEN) significantly affected firm performance (β = 9.409, SE = 4.696, p = 0.045 < 0.05). Therefore, the first condition of mediation was met. The second equation was estimated to test the impact of the independent variables on the mediating variable, and it was found the proportion of women on boards (PerWOMEN) did not have a significant impact on intellectual capital efficiency (β = -0.707, SE = 1.523, p = 0.642 > 0.05). Thus, the second condition of mediation was not met. The third condition of mediation was to explain the impact of the mediating variable on the dependent variable showing that intellectual capital efficiency (β = 1.381, SE = 0.154, p = 0.000 < 0.05) significantly affected firm performance. This met the third criterion. The result of sobel test revealed that the proportion of women on boards (PerWOMEN) had no significant impact on intellectual capital efficiency (β = 0.548, p > 0.05). Consequently, intellectual capital efficiency did not act as mediating variable in the relationship between the proportion of women on boards (PerWOMEN) and financial performance, thus direct relationship was considered.

H_4e: The frequency of board meetings (LOGBMEET) has an indirect effect on firm performance through intellectual capital efficiency.

To examine the mediating effect of intellectual capital efficiency (VAIC), the structural equation model was carried out. The results of the structural equation model showed that the frequency of board meetings (BMEET) significantly affected financial performance (β = -16.388, p < 0.001). Therefore, the first condition of mediation was met. The second equation was estimated to test the impact of the independent variables on the mediating variable, and it was found that the frequency of board meetings (BMEET) did not have a significant impact on intellectual capital efficiency (β = -1.063, p > 0.05). Thus, the second condition of mediation was not met. The third condition of mediation was to explain the impact of the mediating variable on the dependent variable showing that intellectual capital efficiency (β = 0.154, p < 0.05) significantly affected firm performance. This met the third criterion. In summary, the result revealed that the second condition was not achieved, but the first and third conditions of mediation test were achieved. Consequently, intellectual capital efficiency

did not act as mediator in the relationship between the frequencies of board meetings (BMEET) and financial performance, thus direct effects were considered.

H4f: The frequency of audit committee meetings (LOGACMEET) has an indirect effect on firm performance through intellectual capital efficiency.

To examine the mediating effect of intellectual capital efficiency (VAIC), the structural equation model was carried out. The results of the structural equation model showed that the frequency of audit committee meetings (ACMEET) significantly affected firm performance (β = 18.051, SE = 4.547, p = 0.000 < 0.05). Therefore, the first condition of mediation was met. The second equation was estimated to test the impact of the independent variables on the mediating variable, and it was found that the frequency of audit committee meetings (ACMEET) had a significant impact on intellectual capital efficiency (β = 3.847, SE = 1.462, p = 0.009 < 0.05). Thus, the second condition of mediation was met. The third condition of mediation was to explain the impact of the mediating variable on the dependent variable showing that intellectual capital efficiency (β = 1.381, SE = 0.154, p = 0.000 < 0.05) significantly affected firm performance. This met the third criterion. In summary, the result revealed that the first, second, and third conditions of mediation test were achieved. Consequently, intellectual capital efficiency did act as partial mediating variable in the relationship between the frequencies of audit committee meetings (ACMEET) and firm performance.

H4g: The firm with a separate chairman and CEO (BCEODUAL) has an indirect effect on firm performance through intellectual capital efficiency.

To examine the mediating effect of intellectual capital efficiency (VAIC), the structural equation model was carried out. The results of the structural equation model showed that the CEO duality (BCEODUAL) did not significantly affect financial performance (β = -2.854, p < 0.05). Therefore, the first condition of mediation was met. The second equation was estimated to test the impact of the independent variables on the mediating variable, and it was found that the CEO duality (BCEO) did not have a significant impact on intellectual capital efficiency (β = -0.333, p > 0.05). Thus, the second condition of mediation was not met. The third condition of mediation was to explain the impact of the mediating variable on the dependent variable showing that intellectual capital efficiency (β = 0.154, p < 0.05) significantly affected firm

performance. This met the third criterion. In summary, the result revealed that the second condition was not achieved, but the first and third conditions of mediation test were achieved. Therefore, intellectual capital efficiency did not act as mediator in the relationship between the CEO duality (BCEO) and financial performance.

Table 4.8 Standardized direct, indirect, and total effects of the board of director characteristics on firm performance through intellectual capital efficiency

	VAIC			**ROE**		
	DE	**IE**	**TE**	**DE**	**IE**	**TE**
LOGBSIZE	0.110*	0	0.110*	0.017	0.043	-0.026
LOGACSIZE	-0.088	0	-0.088	-0.059	-0.035	-0.025
PerBIND	0.019	0	0.019	-0.094*	0.007	-0.102
PerWOMEN	-0.023	0	-0.023	0.079*	-0.009	0.088
LOGBMEET	-0.058	0	-0.058	-0.239*	-0.023	-0.216
LOGACMEET	0.152*	0	0.152*	0.263*	0.06	0.203*
BCEODUAL	-0.029	0	-0.029	-0.092	-0.011	-0.081
FIRMAGE	-0.017	0	-0.017	-0.024	-0.007	-0.018
BIG4	0.036	0	0.036	0.147	0.014	0.133
INDUSTRY	0.065	0	0.065	0.033	0.026	0.007
LOGBSIZE	0.11	0	0.11	0.017	0.043	-0.026
VAIC	0	0	0	0.393*	0	0.393*
R^2		0.040			0.261	

According table 4.9, the coefficient of determinant (R^2) showed that the board of director characteristics has an effect on firm performance with the accuracy of 26.1% while intellectual capital efficiency has an effect on firm performance with the accuracy of 4.00%.

Table 4.9 presented the standardized direct effects, indirect effects, and total effects of variables in this study. The result revealed that the size of board of directors (LOGBSIZE) had a positive direct effect on firm performance (direct was 0.017). For

indirect effect, the size of board of directors (LOGBSIZE) had a positive indirect effect on firm performance (indirect effect was 0.043). Besides, it had a positive total effect on firm performance (total effect was -0.026).

Regarding the size of audit committees, the result indicated that the size of audit committees (LOGACSIZE) had a negative direct effect on firm performance (direct effect was -0.059). For indirect effect, the size of audit committees (LOGACSIZE) had a negative indirect effect on firm performance (indirect effect was -0.035). Moreover, it had a negative total effect on firm performance (total effect was -0.025).

Due to the proportion of independent directors, the result showed that the proportion of independent directors (PerBIND) had a negative direct effect on firm performance (direct effect was -0.094). For indirect effect, the proportion of independent directors (PerBIND) had a positive indirect effect on firm performance (indirect effect was 0.007). Furthermore, it had a negative total effect on firm performance (total effect was -0.102).

According to the proportion of women on boards, the result indicated that the proportion of women on boards (PerWOMEN) had a positive direct effect on firm performance (direct effect was 0.079). For indirect effect, the proportion of women on boards (PerWOMEN) had a negative indirect effect on firm performance (indirect effect was -0.009). Finally, it had a positive total effect on firm performance (total effect was 0.088).

Regarding the frequency of board meetings, it indicated that the frequency of board meetings (LOGBMEET) had a negative direct effect on firm performance (direct effect was -0.239). For indirect effect, the frequency of board meetings (LOGBMEET) had a negative indirect effect on firm performance (indirect effect was -0.023). Moreover, it had a negative total effect on firm performance (total effect was -0.216).

Due to the frequency of audit committee meetings, it indicated that the frequency of audit committee meetings (LOGACMEET) had a positive effect on firm performance (direct effect was 0.263). For indirect effect, the frequency of audit committee meetings (LOGACMEET) had a positive indirect effect on firm performance

(indirect effect was 0.060). Besides, it had a positive total effect on firm performance (total effect was 0.203).

According to the firm with a separate chairman and CEO, the result showed that the firm with a separate chairman and CEO (BCEODUAL) had a negative direct effect on firm performance (direct effect was -0.092). For indirect effect, the firm with a separate chairman and CEO (BCEODUAL) had a negative indirect effect on firm performance (indirect effect was -0.011). Furthermore, it had a negative total effect on firm performance (total effect was -0.081).

4.6 Summary of Hypotheses Testing and Results

The key question of this study was how the board of director characteristics affect firm performance though intellectual capital efficiency. Besides, the specific research questions were as follows.

Table 4.9 Summary of the results of hypotheses testing

	Description of Hypotheses	**Results**
H1a	The size of boards of directors (LOGBSIZE) has a positive effect on intellectual capital efficiency.	Supported
H1b	The size of audit committees (LOGACSIZE) has a positive effect on intellectual capital efficiency.	Not Supported
H1c	The proportion of independent directors (PerIND) has a positive effect on intellectual capital efficiency.	Not Supported
H1d	The proportion of women on boards (PerWOMEN) has a positive effect on intellectual capital efficiency.	Not Supported
H1e	The frequency of board meetings (LOGBMEET) has a positive effect on intellectual capital efficiency.	Not Supported
H1f	The frequency of audit committee meetings (LOGACMEET) has a positive effect on intellectual capital efficiency.	Supported
H1g	The firm with a separate chairman and CEO (BCEODUAL) has a positive effect on intellectual capital efficiency.	Not Supported

Table 4.9 Summary of the results of hypotheses testing (Cont.)

	Description of Hypotheses	**Results**
H2a	The size of boards of directors (LOGBSIZE) has a positive effect on firm performance	Not Supported
H2b	The size of audit committees (LOGACSIZE) has a positive effect on firm performance	Not Supported
H2c	The proportion of independent directors (PerIND) has a positive effect on firm performance.	Not Supported
H2d	The proportion of women on boards (PerWOMEN) has a positive effect on firm performance.	Supported
H2e	The frequency of board meetings (LOGBMEET) has a positive effect on firm performance.	Supported
H2f	The frequency of audit committee meetings (LOGACMEET) has a positive effect on firm performance.	Supported
H2g	The firm with a separate chairman and CEO (BCEODUAL) has a positive effect on firm performance.	Not Supported
H3	The intellectual capital efficiency (VAIC) has a positive effect on firm performance.	Supported
H4a	The size of board of directors (LOGBSIZE) has an indirect effect on firm performance through intellectual capital efficiency.	Full Mediation
H4b	The size of audit committees (LOGACSIZE) has an indirect effect on firm performance through intellectual capital efficiency.	No effect
H4c	The proportion of independent directors (PerBIND) has an indirect effect on firm performance through intellectual capital efficiency.	Direct effect
H4d	The proportion of women on boards (PerWOMEN) has an indirect effect on firm performance through intellectual capital efficiency.	Direct effect

Table 4.9 Summary of the results of hypotheses testing (Cont.)

	Description of Hypotheses	**Results**
H4e	The frequency of board meetings (LOGBMEET) has an indirect effect on firm performance through intellectual capital efficiency.	Direct effect
H4f	The frequency of audit committee meetings (LOGACMEET) has an indirect effect on firm performance through intellectual capital efficiency.	Partial Mediation
H4g	The firm with a separate chairman and CEO (BCEODUAL) has an indirect effect on firm performance through intellectual capital efficiency.	No effect

4.7 The Qualitative Result

This section presented the qualitative research result from the in-depth interview. It was an evidence to confirm the result of quantitative research. The research samples of the interview were board of directors and audit committees. The results of all interviews were shown in the following:

1. How does the number of board affect intellectual capital efficiency and firm performance?

2. How does the number of audit committee affect intellectual capital efficiency and firm performance?

3. How does the proportion of independent directors affect intellectual capital efficiency and firm performance?

4. How does the proportion of women on boards affect intellectual capital efficiency and firm performance?

5. How does the frequency of board meetings affect intellectual capital efficiency and firm performance?

6. How does the frequency of audit committee meetings affect intellectual capital efficiency and firm performance?

7. How does the firm with a separate chairman and CEO affect intellectual capital efficiency and firm performance?

Table 4.10 Results of in-depth interview questions

Hypotheses			1	2	3	Total Board	1	2	3	Total AC	Total	Result of interview	Result of research	Discussion
H1a: LOGBSIZE	→	VAIC	✓	✓	✓	3	✓	✓	✓	3	6	Supported	Supported	✓
H1b: LOGACSIZE	→	VAIC	✓	✓	✓	3	✓	✓	✓	3	6	Supported	Not Supported	Contrast
H1c: PerIND	→	VAIC	✓	✓	✓	3	✓	✓	✓	3	6	Supported	Not Supported	Contrast
H1d: PerWOMEN	→	VAIC	✓	✓	✓	3	✓	✓	✓	✓	6	Supported	Not Supported	Contrast
H1e: LOGBMEET	→	VAIC	✓	✓	✓	3	✓	✓	✓	3	6	Supported	Not Supported	Contrast
H1f: LOGACMEET	→	VAIC	✓	✓	✓	3	✓	✓	✓	3	6	Supported	Supported	✓
H1g: BCEODUAL	→	VAIC	✓	✓	✓	3	✓	✓	✓	3	6	Supported	Not Supported	Contrast
H2a: LOGBSIZE	→	ROE	✓	✓	✓	3	✓	✓	✓	3	6	Supported	Not Supported	Contrast
H2b: LOGACSIZE	→	ROE	✓	✓	✓	3	✓	✓	✓	3	6	Supported	Not Supported	Contrast
H2c: PerIND	→	ROE	✓	✓	✓	3	✓	✓	✓	3	6	Supported	Not Supported	Contrast
H2d: PerWOMEN	→	ROE	✓	×	✓	2	✓	✓	✓	3	5	Supported	Supported	✓
H2e: LOGBMEET	→	ROE	✓	×	✓	2	×	✓	✓	2	4	Supported	Not Supported	Contrast
H2f: LOGACMEET	→	ROE	✓	✓	✓	3	✓	✓	✓	3	6	Supported	Supported	✓
H2g: BCEODUAL	→	ROE	✓	✓	✓	3	✓	✓	✓	3	6	Supported	Not Supported	✓

CHAPTER 5
CONCLUSION AND RECOMMENDATIONS

This chapter was divided into four parts. The first part contained the discussions of research questions. The second part discussed the contribution of the study. The third part discussed the limitation of the study. The last part provided the implication of practical that presents the benefit from the research finding and guideline to business firm operation as well as the suggestion for future research.

This study was to investigate the effects of board of director characteristics on firm performance through intellectual capital efficiency in the Stock Exchange of Thailand (SET). The research proposed the assumptions that firm performance may come from board of director characteristics through intellectual capital efficiency.

This study focused on research questions and hypotheses as follows:

Research Question 1: Are there any direct effects of board of director characteristics on intellectual capital efficiency of listed companies on the Stock Exchange of Thailand?

Research Hypothesis 1: The board of director characteristics has a positive effect on intellectual capital efficiency of listed companies on the Stock Exchange of Thailand. There were seven hypotheses including:

H1a: The size of board of directors (LOGBSIZE) has a positive effect on intellectual capital efficiency, H1b: The size of audit committees (LOGACSIZE) has a positive effect on intellectual capital efficiency, H1c: The proportion of independent directors (PerBIND) has a positive effect on intellectual capital efficiency, H1d: The proportion of women on board (PerWOMEN) has a positive effect on intellectual capital efficiency, H1e: The frequency of board meetings (LOGBMEET) has a positive effect on intellectual capital efficiency, H1f: The frequency of audit committee meetings (LOGACMEET) has a positive effect on intellectual capital efficiency, H1g: The firm with a separate chairman and CEO (BCEODUAL) has a positive effect on intellectual capital efficiency.

Research Question 2**:** Are there any direct effects of board of director characteristics on firm performance of listed companies on the Stock Exchange of Thailand?

Research Hypothesis 2: The board of director characteristics has a positive effect on firm performance of listed companies on the Stock Exchange of Thailand. There were seven hypotheses including:

H2a: The size of board of directors (LOGBSIZE) has a positive effect on firm performance, H2b: The size of audit committees (LOGACSIZE) has a positive effect on firm performance, H2c: The proportion of independent directors (PerBIND) has a positive effect on firm performance, H2d: The proportion of women on board (PerWOMEN) has a positive effect on firm performance, H2e: The frequency of board meetings (LOGBMEET) has a positive effect on firm performance, H2f: The frequency of audit committee meetings (LOGACMEET) has a positive effect on firm performance, and H2g: The firm with a separate chairman and CEO (BCEODUAL) has a positive effect on firm performance.

Research Question 3: Are there any direct effects of intellectual capital efficiency on firm performance of listed companies on the Stock Exchange of Thailand?

Research Hypothesis 3: Intellectual capital efficiency (VAIC) has a positive effect on firm performance.

Research Question 4: Is there any effect of board of director characteristics on firm performance through intellectual capital efficiency of listed companies on the Stock Exchange of Thailand?

Research Hypothesis 4: Intellectual capital efficiency links between board of director characteristics and firm performance. There were seven hypotheses including:

H4a: The size of board of directors (LOGBSIZE) has an indirect effect on firm performance through intellectual capital efficiency, H4b: The size of audit committees (LOGACSIZE) has an indirect effect on firm performance through intellectual capital efficiency, H4c: The proportion of independent directors (PerBIND) has an indirect effect on firm performance through intellectual capital efficiency, H4d:The proportion of women on board (PerWOMEN) has an indirect effect on firm performance through intellectual capital efficiency, H4e: The frequency of board meetings (LOGBMEET)

has an indirect effect on firm performance through intellectual capital efficiency, H4f: The frequency of audit committee meetings (LOGACMEET) has an indirect effect on firm performance through intellectual capital efficiency, H4g: The firm with a separate chairman and CEO (BCEODUAL) has an indirect effect on firm performance through intellectual capital efficiency.

The populations based on SETSMART was 545 companies. Excluding, 15 with companies under rehabilitation, 58 companies in financial industries (banking, finance, and insurance), 53 companies with property fund and real estate investment, 15 with missing Data, and 10 with outlier data. Total sample size were 403 companies listed on the Stock Exchange of Thailand (SET) in 2014 on the rate of 73.95% of the total number of listed companies which were analyzed.

The normal distribution of this sample was checked by using skewness and kurtosis value. In this study, the skewness value was between -0.84 to 2.58 whereas kurtosis value was between -1.70 to +8.07. The result showed the descriptive results in 2014. The mean of firm performance (ROE) had an average value of 8.38, the mean Value Added of Intellectual Capital (VAIC) was estimated at 2.49. With respect to board of director characteristics, the mean of the size of board of directors (BSIZE) were 10.31. The mean of the size of audit committees (ACSIZE) were 10.31. The mean of independent directors (BIND) were 4.04. The mean of women on board (BWOM) were 1.75. The mean of frequency of board meetings (BMEET) were 7.50. The mean of frequency of audit committee meetings (ACMEET) were 6.30. The mean of firm with separate chairman and CEO (BCEODUAL) were 0.63

The mean natural logarithm of board size (LOGBSIZE) was 1.00, Natural logarithm of audit committee size (LOGACSIZE) was 0.49, the proportion of board independence (PerBIND) was 0.40, the proportion of women on board (PerWOMEN) was 0.17, the natural logarithm of frequency of board meeting (LOGBMEET) was 0.83 and the natural logarithm of frequency of audit committee meeting (LOGACMEET) was 0.75. With respect to the control variables, the mean of type of audit firms (BIG4) was 0.69, the firm age (FIRMAGE) was 17.60 and the industry type (INDUSTRY) was 0.68.

5.1 Discussions of Research Findings

This section provided research discussions regarding the research questions on both hypothesis testing and in-depth interview.

5.1.1 Discussion of Research Question 1

Research question 1: Are there any direct effects of board of director characteristics on intellectual capital efficiency of listed companies on the Stock Exchange of Thailand? The hypotheses associated to this question included H1a, H1b, H1c, H1d, H1e, H1f, and H1g which were described as follows.

The coefficient of the size of board of directors revealed a positive effect on intellectual capital efficiency at a significance level of 0.05. Thus, hypothesis 1a was supported, and this was consistent with the findings of Abeysekera (2010), which stated that the larger boards are more likely to include increased pool of expertise that will enhance boards' information processing capabilities. Similarly, Abidin et al. (2014) showed that board members will mitigate individual directors' deficiencies in business skills through collective decision making which in turn improves the quality of firm strategic decisions and actions. In addition, due to the in-depth interview, board of directors and audit committees also confirm that the numbers of the board affects the increasing efficiency of intellectual capital. However, it should depend on the qualifications of the board such as education, accounting knowledge, financial, laws, and the experiences in the industry affecting the business which leads to the resources implementation approach. Meanwhile, the coefficient of the frequency of audit committee meetings showed a positive effect on intellectual capital efficiency at a significance level of 0.05. Thus, the hypothesis 1f was supported. This was consistent with the findings of Karamanou and Vafeas (2005) which stated that the frequent meeting of audit committees will allow for more time in the worth resources used auditing and for the utmost benefits of the organization. Furthermore, Li et al. (2008) recommended that the audit committee shall hold at least three or four meetings each year and special meetings when necessary. Thus, the audit committee meetings are more often and will have more influence in regulating the practice of intellectual capital performance. In addition, according to the in-depth interview, the number of the audit

committee meetings will affect the efficient intellectual capital management when the committee is aware of its duties and roles.

On the other hand, the coefficient of the proportion of independent directors did not show an effect on intellectual capital efficiency at a significance level of 0.05. Thus, the hypothesis 1c was not supported. This was consistent with the findings of Kelton et al. (2008), who studied on the influence of board of director characteristics on intellectual capital efficiency since the board independence is a part of the governing structure with no relationship to the business, family, and the internal network of the company. The board independence must have the professional role to freely provide the opinion without considering any parties and can reduce the conflict of interests. As for the companies in Thailand, however, the board independence may not have the real independence. Besides, based on the in-depth interview, the high proportion of the independent committee showed the transparency of the company's operation. If the independent committee is not devoured with the other board, who normally involve with the executives or the big shareholders, it will increase the efficiency of the intellectual capital.

Furthermore, the coefficient of the size of audit committees did not show a significant effect on intellectual capital efficiency. Thus, the hypothesis 1b was not supported, indicating that the size of audit committees did not significantly affect intellectual capital efficiency at a significance level of 0.05. This was consistent with the findings of Mahmudi and Nurhayati (2014) who studied on the influence of board governance characteristics on intellectual capital performance and found that size of audit committee has an insignificant effect on intellectual capital efficiency. The business with high number of audit committees would join to audit on the benefits from the use of the company's resources, especially the intellectual capital. The reason could be that the company with too many audit committees may result in the lower value of intellectual capital as well. It is the governing mechanism for Thailand's good governance. In addition, Lin et al. (2008) found that the size of audit committee has a positive effect on intellectual capital performance. It is predicted that the size of the larger audit committee is expected to better maintain the intellectual capital performance of the company. Audit committee can improve the effectiveness of the

board of commissioners in implementing the company's internal control as well as help improve the company performance including intellectual capital performance. Besides, due to the in-depth interview, the number of the committees slightly affects intellectual capital efficiency. However, it should depend on the qualifications of the committee, such as education, accounting knowledge, financial, laws, and the experiences and skill in the industry affecting the business, which leads to the resources implementation approach. Moreover, the coefficient of the proportion of women on boards did not show an effect on intellectual capital efficiency. Therefore, the hypothesis 1d was not supported, indicating that the proportion of women on boards did not significantly affect intellectual capital efficiency at a significance level of 0.05. This was opposite to the findings of Swartz and Firer (2005), who studied on the board structure and intellectual capital performance in South Africa and no statistical significance is found on the proportion of women on boards. In addition, due to the in-depth interview, board of directors and audit committees also confirm that the current female executives are more professional which is beneficial to all organizations. It is because they are tolerant to high pressure environment. Their decision-making is done by the consideration of all-rounded factors, and they also manage the company' resources for higher benefits. Furhermore, the coefficient of the frequency of board meetings did not show a significant effect on intellectual capital efficiency. Thus, the hypothesis 1e was not supported, indicating that the frequency of board meeting did not significantly affect intellectual capital efficiency at a significance level of 0.05. This study was in contrast to the study of Al-Musali and Ismail (2015) who studied about board diversity and intellectual capital efficiency. They found that the moderating role of the effectiveness of board meetings that is under the diversity of board of directors and high amount of board of directors during the meeting tend to change the strategy and adjust on the operational plan for the intellectual capital. This was consistent with the in-depth interview that the number of the committee meetings does not directly matter, but its quality does. It would be considered from the meeting agenda which is concerned about the leveraging of the company's resources. Furthermore, the coefficient of the firm with a separate chairman and CEO did not reveal a significant effect on intellectual capital efficiency. Therefore, the hypotheses 1g was not supported, indicating that the firm

with a separate chairman and CEO did not significantly affect intellectual capital efficiency at a significance level of 0.05. This means if the firm separates chairman and CEO apart, it will not have any impact on intellectual capital efficiency, and this conforms to the expected hypothesis. This study conforms to the result from the study of Abidin (2009) on the board structure and corporate performance in Malaysia, and it was found that there is no relationship between the separation of chairman and CEO duties from the business performance. Normally, it will separate the owner out of management which leads to the inequality in information receiving from the agent and representative and causes the conflicts between them. From the study of Ho and Williams (2003), the relationship between value of intellectual capital and the company with CEO Duality was found. It has the effects on strategic forming for the organization, and the management is strongly independent in the operation. However, this could lead them to decide things for the benefit of themselves as well as use the company's resources without value that does not increase any value to the intellectual capital which will give benefit to the company from those resources. This was consistent with the in-depth interview that the merging of the board of committee and managing director positions for one person will normally show negative relationship toward the increasing efficiency of the business intellectual capital. It might also reflect the downfall administrative capability.

5.1.2 Discussion of Research Question 2

Research question 2: Are there any direct effects of board of director characteristics on firm performance of listed companies on the Stock Exchange of Thailand? The hypotheses associated to this question consisted of H2a, H2b, H2c, H2d, H2e, H2f, and H2g which were described as follows.

The coefficient of the proportion of women on board indicated a positive effect on firm performance at a significance level of 0.05. Therefore, the hypothesis 2d was supported, and the result of this study conforms to the study of Smith, Smith, and Verner (2005) which showed that women in top management affect firm performance, which pays attention to the gender of management with the effect on the firm's performance. The researchers raise the view on the behavioral basis of female leaders with the work characteristics like the independence committees, and they do not stay in

the same social frame with the management committee. Female leader then normally suggests the idea that is different from other committees and management. This helps stimulate the opinions and recommendations in the different views and benefit for the business. According to the study from the sample group, the firm has the proportion of female committees that does not reach to 1 in 3 persons or accounted for 21.34 percent which cannot clearly measure the level of relationship in the hypothesis. This may cause from the companies in Thailand have less female management or do not have at all in some companies. Nevertheless, the board shall set for the board structure that consists of people with diverse qualifications in skills, experiences, and specific capabilities which benefit for the firms as well as set the gender, and there shall be at least one of the boards with the experience in the main business and industry in which the firm operates. The board shall set the launch of the policy, the board diversity components, and the effective years as the board of each committee in the annual report and on the company's website. In addition, according to the response from the in-depth interview with board of directors and audit committees, it also confirms that the current female executives are more professional which is beneficial to all organizations. It is because they are tolerant to high pressure environment. Their decision-making is done by the consideration of all-rounded factors, and they also manage the company' resources for higher benefits. Meanwhile, the coefficient of the frequency of audit committee meetings showed a positive effect on firm performance at a significance level of 0.05. Therefore, the hypothesis 2f was supported, and the result of this study conforms to the study of Bapepam (2004) suggesting that the audit committee held a meeting with the same frequency as the frequency of meeting at the minimum requirements set out in the board of commissioners' statutes. In addition, Goodwin (2003) and Vafeas et al. (2005) stated in their studies that the more the number of the audit committee, the frequency of meetings between the audit committee and internal audit firm to be more frequent in order to assess the performance. Besides, based on the in-depth interview with board of directors and audit committees, it also confirms that the number of the audit committee meetings will affect the performance of company management when the committee is aware of its duties and roles.

On the other hand, the coefficient of the proportion of independent directors showed a negative effect on firm performance at a significance level of 0.05. The result did not support the hypothesis 2c. This result was in contrast to the study of Ramdani and Witteloostuijn (2010) which argued that a larger proportion of independent directors will promote better firm performance. This agency theory assumes that managers are individualistic, opportunistic, and self-serving. Then, effective monitoring by independent boards is a key to make executives effectively pursue shareholder rather than self-interests. The (often implicit) assumption is that independent directors are not hindered by tendencies to pursue private interests. Consequently, boards with more independent directors can perform managerial monitoring tasks more effectively. In Thailand, the context of proportion of board independence setting for the listed companies on the Stock Exchange market according to the best practice of good governance is that the board should consist of independence committee more than a half of total committees. From the data collection, it is found that the proportion of board independence in most of the firms is quite closely or about 3 persons or accounted for 40 percent of the proportion of board independence. Mostly less than a half of the total committees that are the listed companies in Thailand have proper proportion of board independence, and this leads to the well performance of the business. In addition, the in-depth interview with board of directors and audit committees also confirms that the high proportion of the independent committee showed the transparency of the company's operation. If the independent committee is not devoured with the other committees, who normally involve with the executives or the big shareholders, it will increase the firm performance. Furthermore, the coefficient of the frequency of boar meetings indicated a negative effect on firm performance at a significance level of 0.05. The result did not support the hypothesis 2e. The result was consistent with the study of Vefeas (1999) which argued that the limited time directors normally spend together is not used for the meaningful exchange of ideas among themselves. Instead, routine tasks, such as presentation of management reports and various formalities absorb much of the meetings, and this reduces the amount of time that outside directors would have to effectively monitor management (Lipton & Lorsch, 1992), which can have a negative impact on corporate performance, and board meetings are costly in terms of managerial

time, travel expenses, refreshments, and directors' meeting fees. Generally, large companies also need more meeting for monitoring all major aspects. The increase in the frequency of the audit committee meeting might reflect that the company faced problems and tried to solve those problems, which were occurred from operating without planning or poor performance. From the descriptive data, it was found that the listed firms on the Stock Exchange do not have more than 6 times for 212 companies or accounted for 55.09 percent in accordance with the best practice on good governance. In addition, based on the in-depth interview, board of directors and audit committees contradict that the number of the committee meetings directly matter, but its quality does. It would be considered from the meeting agenda which is concerned about the leveraging of the company's resources.

Furthermore, the coefficient of the size of board of directors did not show a significant effect on firm performance. Thus, the hypothesis 2a was not supported, indicating that the size of board of directors did not significantly affect firm performance at a significance level of 0.05. This finding is similar to the findings of Ho and Williams (2003) conducted in South Africa, Sweden, and the UK and found that it has a negative relationship with the return ratio in the proportion of shareholders. Since there are the differences in the business characteristics, the exceeding size of the firm's board of directors can result in the delay of decision and have an effect on the loss of investment opportunities of the firm as well as the firm's performance. The firm with small size of board of directors allows them to work more effectively and have better performance compared to the firm with bigger size of board of directors. This was inconsistent with the in-depth interview which showed that the numbers of the board affect the increasing firm performance. However, it should depend on the qualifications of the committee, such as education, accounting knowledge, financial, laws, and the experiences in the industry affecting the business which leads to the resources implementation approach. Meanwhile, the coefficient of the size of audit committees showed an insignificant effect on firm performance. Therefore, the hypothesis 2b was not supported, indicating that the size of audit committees insignificantly affected firm performance at a significance level of 0.05. The result was consistent with the study of Ghabayen (2012) which found that audit committee size has no relationship with firm

performance. The study could not provide a significant relationship between audit committee size and firm performance. Furthermore, Mak and Kusnadi (2005) studied on the relationship between corporate governance and firm performance in Malaysia and Singapore, and they could not find any significant association between audit committee and the value of the firm. However, the proper size of audit committee is still debatable in the corporate governance mechanism. Some empirical studies find that the normal size of the audit committees in the UK and USA is about three to five members (Davidson et al., 2004). Some others argue that the larger size of audit committee may delay the decision making and cause avoidable debates (Yermack, 1996). In addition, due to the in-depth interview, the audit committee should focus on the effectiveness rather than size, and they do not consider the audit committee size as an important factor in enhancing the effectiveness of the committees. In order to make the audit committee perform more effectively, it should consist of independent experts and knowledgeable members and have adequate authority. Nonetheless, the coefficient of the firm with a separate chairman and CEO indicated an insignificant effect on firm performance. Thus, the hypothesis 2g was not supported, indicating that the firm with a separate chairman and CEO insignificantly affected firm performance at a significance level of 0.05. The result was consistent with the study of Gill et al. (2006) on the impact of board size, CEO duality, and corporate liquidity on the profitability of Canadian service firms which found that there is a relationship between merging of chairman and CEO and the firm's performance. According to the best practice, the chairman and CEO should not be the same person because if they are, the management will have too much independent in the operation and may allow them to make decisions which are the benefits for their own and without consideration for the utmost benefits for the shareholders which can finally cause damage and financial risk to the firm. According to the descriptive analysis, it is found that 36.72 percent of the listed companies in this study did not conform to the good governance practice in merging of chairman and CEO. It reflects that some listed companies still lack of segregation of duties between the chairman and CEO. Thus, there is no balance of power in the company. This could make the shareholders lack of confidence in the good governance mechanism for the committees and management to work carefully with loyalty to preserve for the mutual

benefits of the company at first. This was in contrast to the in-depth interview that the managing of director positions for one person will normally show a negative relationship toward the increasing performance of the business. It might also reflect the downfall administrative capability.

5.1.3 Discussion of Research Question 3

Research question 3: Are there any direct effects of intellectual capital efficiency on firm performance of listed companies on the Stock Exchange of Thailand? To respond to this research question, the hypothesis testing was performed with the hypothesis 3

The hypothesis 3 of the study was placed that value of intellectual capital can have effects on firm performance at a significance level of 0.05. The result showed that intellectual capital efficiency has the positive effects on firm performance at a significance level of 0.05. This means the highly value of intellectual capital will have result toward better firm performance which conforms to the expected hypothesis. This also conforms to the study of Sany et al. (2014) which found that one thing in intellectual capital efficiency is technological that results in the prosperity of the company with the competitive advantages for the organizational sustainability. Besides, Chen et al. (2005) found that the investors will measure on the firm value from the efficiency in the more usage of intellectual capital that would result in the increasing of firm performance.

5.1.4 Discussion of Research Question 4

Research question 4: Is there any effect of board of director characteristics on firm performance though intellectual capital efficiency of listed companies on the Stock Exchange of Thailand? The hypotheses associated to this question consisted of H4a, H4b, H4c, H4d, H4e, H4f, and H4g which were described as follows.

H4a: The size of board of directors has an effect on firm performance with no statistical significance. Meanwhile, the influence of intellectual capital efficiency is a mediator variable of board of director characteristics which influences firm performance in accordance with references from the studies of Judd and Kenny (1984) and MacKinnon, Lockwood, Hoffman, West, and Sheets (2002). The reason is according to the influence from intellectual capital efficiency that helps the size of board of director

to influence the business performance. In the best practice, when most of the board of directors takes efficient care of the resources, the performance will be better accordingly.

H4b: The size of audit committees has an effect on firm performance with no statistical significance. However, intellectual capital efficiency helps the size of audit committees and firm performance that is the best practice of corporate governance. It is possible that the audit committee will make more availability of resources which will be more limited. This will lead to resource savings resulting in the benefits to the business and higher performance.

H4c: The proportion of independent directors does not have an effect on intellectual capital efficiency and intellectual capital efficiency will have an effect on firm performance. It shows that the proportion of independent directors to firm performance is a direct effect. The reason is that the proportion of independent directors will not depend on intellectual capital efficiency because the independent directors as individuals did not manage or participate in the management of the company or affect the company. The independent directors are independent of management. A major shareholder who has control does not affect the business or is interested in the company or affect the company. This may cause the company's interests, and the interests of the shareholders must be reduced.

H4d: The proportion of women on board does not have an effect either directly on the results of operations or indirectly through intellectual capital causing the company to cater to women who had no role in the delivery obligation and administration of resources.

H4e: The frequency of board meetings has no effect on intellectual capital efficiency, but there are significant direct effects on firm performance. There is a direct effect if the board of directors meetings is frequently held, and firm performance will decrease. The participants would tend to change the policy of the company.

H4f: The frequency of audit committee meetings has an effect on firm performance and intellectual capital efficiency. It is the partial mediating of a direct and indirect effect or be affected by others to join. This is because if the board meetings are held regularly, they would make the operating results fall due to attending a meeting as

they will tend to change the policies of the company. Besides, the audit committee meetings often have the time to monitor the use of resources of the company to maximize the value benefit to the company.

H4g: The firm with a separate chairman and CEO has a direct effect on firm performance, but it has no effect on intellectual capital efficiency. It is so called direct effect that has split the chairman and directors from each performance will decrease. Listed companies used in this study were a total of 36.72 percent of non-compliance with the principles of good corporate governance, mergers, and management positions with the same chairman. Some listed companies showed that the lack of separation of powers between the executive responsible for the administration of the president and prevent the counterbalance each other company. Also, the shareholders of the company may lack confidence in the mechanisms of good governance.

5.2 Limitation of the Study

This study was based on the listed companies on the Stock Exchange of Thailand (SET). Different countries around the world apply different national accounting standards, disclosure, and listing requirements. These differences can affect the results of this model in other regions. Now, the Securities and Exchange Commission of Thailand is taking active steps to adopt all international financial reporting standards like many other regions around the world which will mitigate the comparison problem to arise due to the differences in accounting rules of different countries.

The validity of the study can be criticized on the grounds of VAIC method, which is used in the study for measuring intellectual capital efficiency. Nevertheless, it should be considered that up until now no method of measuring intellectual capital efficiency has been admitted as perfect by the researchers' community. Further, VAIC has been used by the majority of researchers in measuring intellectual capital efficiency at a corporate level.

Since data affected private limited companies are not publicly available, this study is limited to listed companies, and its results may not be generalized to non-listed corporate sector.

5.3 Implication for Practice

This study was to provide the evidence of the relationships among board of director characteristics, intellectual capital efficiency, and firm performance.

5.3.1 Implication for Academic Knowledge

This study contributed to the reference for the researcher who would conduct the literature on intellectual capital in the future. In particular, this study used the structural equation model for path analysis which has never been utilized to examine the corporate governance affecting the intellectual capital and firm performance. This study was the evidence of the influence of intellectual capital which was the good transfer of board of director characteristics in terms of number of directors, number of audit committees, and audit committee meeting. It was the important reference as the guidelines for corporate governance that the firm could achieve the objectives according to the agency theory. The results revealed that board of directors played an important role in administrating the resource and intellectual capital efficiently and usefully which resulted in the increase of firm performance. Especially, based on the in-depth interview with the auditing committee and the board of the company, they gave the similar opinions that the roles of committees shall stress on the quality of the board rather than quantity. This would result in the better potential in the operation management from the worthily used of the business resources. This would lead to the efficiency in operation and the utmost benefits of the organization.

5.3.2 Implication for Investors and Regulators

From the results of the study, it would be the supportive information for the activities and the relevant agencies to see the significance of the intellectual capital, which was not the financial information but the information disclosed in financial statement report. Moreover, it could be applied to the administration to become more efficient and to be the guideline for the investors to consider further investment in the Stock Exchange of Thailand by considering the possibility of the firm's value based on corporate governance mechanism. It allows us to know the size of board of directors, size of audit committee and the audit committee meeting which all affect the intellectual capital affecting the increasing performance as a result. Meanwhile, independent committee ratio, female committee ratio, CEO duality, and the board of directors

meeting had the influence on firm performance. Therefore, all were the factors that the investors should give more importance.

5.4 Futher Research

This study focused on certain characteristics of the board of directors. They are the persons who function to govern the company's operation according to the laws, objectives, and regulations of the company, the consensus of the shareholders' meeting, and the corporate governance policy. Therefore, in the governance, the committees must consider making the business decision and act in what they reasonably believe for the utmost benefits of the company and the shareholders. Consequently, for the future research the researcher should include new variables affecting other characteristics of the board of directors such as education levels, compensation, work experiences, accountant knowledge, financial laws, and updating with the current world economic situation as these variables might affect intellectual capital efficiency and firm performance. Besides, based on the in-depth interview with the auditing committee and the board of the company, they gave the similar opinions that the roles of committees shall stress on the quality of the board rather than quantity. This would result in the better potential in the operation management from the worthily used of the business resources. This would lead to the efficiency in operation and the utmost benefits of the organization. However, in the future the researcher should separate the types of committee into subgroup according to the appropriateness in each company since each company has the subgroup committees with diverse roles. The examples are such as the nomination and compensation committees, corporate governance committees, sustainable development committees, leadership development committees, and sustainable development committees.

For the measurement on the intellectual value capital in this study, the researcher used Value Add Intellectual Capital (VAIC) (Pulic, 2000). Besides, it was also the qualitative measurement method widely used to seek for the relationships among the variables such as Kaplan and Norton's Balanced Scorecard (Kaplan & Norton, 1992), Karl-Erik Sveiby's Intangible Assets Monitor (Sveiby, 1997), and Skandia's Value Scheme (Edvinsson & Malone, 1997).

In this study, the problem of endogenous variables has not been addressed. There may have been a reverse effect of financial performance such as return on asset, return on investment, earnings per shares on adopting good corporate governance practices to attract more funds from the Stock Exchange of Thailand. The problem of endogenous variables may be addressed after applying Two-Stage Least Square (2SLS) methodologies. Test of mediation may be applied to reconfirm the role of intellectual capital efficiency between the board of director characteristics and firm performance.

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Declaration

This work contains no material which has been accepted for the award of any other degree or diploma in any university or other tertiary institution and, to the best of my knowledge and beliefs, contains on material previously published or written by another person, except where due reference has been made in the text.

I give consent to this copy of my dissertation, when deposited in the university library, being available for loan and photocopying.

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