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Board of Directors' Effectiveness and Enterprise Risk Management: Do Effective Boards Improve Risk Oversight?

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Abstract

This study explores the efficiency of both the board of directors and audit committee in providing risk oversight through Enterprise Risk Management (ERM) implementation. ERM is a business strategy that assists the board of directors in handling the risk oversight within the enterprise. ERM implementation and risk management committee effectiveness combine as factors that affect the effective risk oversight efforts to ensure the key risks facing a company are well managed and ultimately enhance shareholder values. The study analyzed secondary data from 444 listed companies from the Stock Exchange of Thailand (SET) from 2015 to 2017. The results show that both the board of directors' effectiveness and the audit committee's effectiveness are significantly related to the effectiveness of risk oversight. Firm size is correlated with risk oversight, while the Big 4 auditors are not significantly related to effective risk oversight. These results show there is a linkage between governance quality and risk management quality. This study suggests various board characteristics and audit committee characteristics such as size, independence, experience, and frequency of meetings are related to the effectiveness of monitoring corporate risk. Hence, the research findings of corporate governance and risk management and may be of interest to regulatory policymakers.

Keywords

Risk Management, Board Characteristics, Corporate Governance, Risk Oversight

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Introduction

The structure of corporate governance and traditional risk management systems are problems that face firms and their boards (Ingley & Van Der Walt, 2008). Effective risk management is a central factor in corporate governance and is associated with the efficiency of boards that are responsible for risk management implementation. A new idea for effective risk management is Enterprise Risk Management (ERM), which aims to manage risk within an enterprise while taking its objectives into account. Following the 2007 financial crisis, ERM has been advocated by consultants and regulators and has become a popular business strategy (Fraser & Simkins, 2010).

Risk is exposure to lose or the variability of results and has a major impact on an organisation (Abdel-Khalik, 2013). So, firms must manage risk appetite and potential outcomes to maximise profits and minimise risk (Nickel, Saldanha-da-Gama, & Ziegler, 2012). Berinato (2004, p. 48) pointed out that "Balancing risk is becoming the only effective way to manage a corporation in a complex world." Both risk and uncertainty involve randomness (Rakes, Deane, & Rees, 2012). ERM is a process that businesses can apply across their spheres of operation to identify potential risks and provide countermeasures to manage those risks to preserve value for all stakeholders within the organisation. This well-defined framework provides a clear path that makes it easy for businesses of any size to manage risk effectively. The ERM process looks at risk management within an organisation. In other words, it removes any disparities in how different departments look at risk and, instead, introduces a streamlined risk management course with the board of directors taking the lead in risk management within the organisation to enhance shareholder value.

ERM stresses that firms that implement risk management can increase their value with improved internal decisions (Nocco & Stulz, 2006), as they have a competitive advantage (Hoyt & Liebenberg, 2011), increasing corporate governance practice (Gates, 2006), and can strengthen of the organisation's control environment (Arnold, Benford, & Sutton, 2011). This includes better risk management decisions (Cummins, Phillips, & Smith, 2001), enhancing supply chain management (Liang, Wang, & Gao, 2012), gaining cost efficiency, improving business decisions (Grace, Leverty, Phillips, & Shimpi, 2010), and assisting the work of external auditors (Chalevas, 2014). ERM implementation is very challenging for most enterprises as it requires time, effort and intensive investment (Nocco & Stulz, 2006).

The board of directors, regulators and advisories advocate the use of the ERM framework to improve corporate risk-taking and risk monitoring. The risk management paradigm is a change from the stand-alone responsibility of the organisation. It has relevance to the subject of governance, which should unswervingly be in the oversight restraint of the board of directors (Lipton, Niles, Miller, & Lipton, 2018). Boards are responsible for putting

the risk management system in place but usually appoint an audit committee to oversee and monitor the risk management system. Thus, the role of the boards and audit committees is crucial in implementing risk management and how the structures of the boards and audit committees are related to effective risk oversight. This study backs previous research by investigating the association between board efficiency and audit committee efficiency and its relation to effective risk oversight. Previous research studies governance and company risk-taking (Baulkaran, 2014; Eling & Marek, 2014; Ferreira & Laux, 2007; John, Litov, & Yeung, 2008) and board effectiveness that is related to the risk management committee (Subramaniam, McManus, & Zhang, 2009; Yatim, 2010). The significance of the association between specific board effectiveness and audit committee effectiveness and how this relates to risk management oversight has not been found yet. Therefore, the goal of this study is to fulfil this research gap by considering an enterprise risk management concept that is in accordance with the corporate governance literature.

Literature Review and Hypothesis Development

Thai Corporate Governance and ERM Mechanism

After Thailand's economic crisis in 1997, the government adopted reforms to help revive the country's economy. ERM was formally introduced to many economic sectors to prevent the changes that were more evolutionary than revolutionary. Through the work of the national corporate governance committee of 2002, "The Year of Good Governance," it was clear that the board of directors is an important part of ERM. The board was supposed to affect the effectiveness of a self-policing concept of corporate governance.

Corporate governance (CG) is how an organisation is focused, administered, and controlled. It is a situation where importance is accrued to both regulation and the supervision of institutions (Freeland & Granovetter, 2001). This is the relationship that develops between the management of the company, its stockholders, and boards, together with other shareholders. It is tailored to realising an organisation's goals and considers shareholders' interests by considering stakeholders (Gilson, 2005).

As a result of corporate governance being an important part of ERM, 2002 was termed 'The Year of Good Corporate Governance,' through which the stock exchange of Thailand (SET) brought in some crucial reforms that sought to create a competitive economy by enhancing transparency and helping to attract investors. Also, SET introduced a transparent outline of the role of corporate governance in 2006. SET continuously improved corporate governance in Thailand to comply with principles for good corporate governance of the Organisation for Economic Co-operation and Development (OECD). Corporate governance in Thailand was enhanced by the ASEAN CG Scorecard in 2014, which allowed

Thai listed businesses to enhance their corporate governance performances so that they could reach global heights.

To achieve company objectives through corporate governance, the boards needed to establish audit committees or risk management committees that would help with delegation, formulate risk policies, monitor, and assess the efficiency of risk management frameworks. Conversely, it is the management's responsibility to ensure that the risk policies are effectively implemented and to make records of any hitches that need to be reviewed by the relevant committees.

Enterprise Risk Management Implementation

Since the early 2000s, ERM has become popular within the business community due to its implications for financial and accounting risks (Pooser, 2012). The involvement of well-known companies, like WorldCom and Enron, in financial scandals has fuelled the adoption and implementation of ERM practices in order to help control any unforeseen financial malpractices. However, the application of ERM became even more vibrant for both financial and non-financial businesses after the 2008 global financial crisis. ERM helped to handle any internal and external uncertainties that could compromise shareholder value or affect the accomplishment of the company's goals (Pagach & Warr, 2011).

Over the past two decades, many businesses have recognised the fact that prior traditional risk management methods are not effective as they simply treat each type of risk independently (e.g. Hampton, 2009; Pagach & Warr, 2010). This causes a "silo effect." For this reason, businesses have now fully embraced enterprise risk management as a comprehensive holistic view of risk management by unifying all types of risks and managing them to achieve an organisational objective (Rodriguez & Edwards, 2009) to manage risk effectively.

Whereas the traditional risk management methods were reactive, focusing on discrete risks, enterprise risk management is proactive because it has been designed to address risks promptly (Banham, 2005). ERM's main aim is to build an all-inclusive methodology to risk management in a business (Mikes, 2009). A risk management process is thus a top-down approach overseen by the organisation's top management. Therefore, risk handling procedures are developed to handle all manner of risks that the business may face. The advantage this centralised methodology has in risk management is that the chief risk officer cannot overlook any potential risk.

To implement ERM, the COSO ERM framework is undoubtedly the most used and recognised concept of all the ERM frameworks in use today (Gordon, Loeb, & Tseng, 2009; Power, 2009). Having evolved from the US, the framework has proved to be effective in improving the efficiency of risk management in all industries. Apart from the COSO framework (2004) and COSO framework (2017), the business world provides us, through

researchers, with other alternative frameworks to help control both risks and risk impacts within organisations. These alternative frameworks include ISO 31000, Casualty Actuarial Society Framework, and Standard & Poor's ERM, which have helped to implement effective risk management to enhance company value and achieve company objectives.

Risk Oversight

Risk management and risk oversight are the main corporate governance problems (Ho, 2012). Risk oversight is the management of risk management processes and frameworks in an organisation to make sure that the right strategies, processes, and agendas are in place to mitigate against risk. According to COSO ERM (2017), the management of any given organisation is accountable when it takes on the risk oversight role. The boards, therefore, take on the oversight role to make sure that the selected enterprise risk management strategy is applied as per the set guidelines. The ERM framework helps the board's perception of risk oversight, which includes both financial and non-financial risk. Risk oversight maturity is related to the complete, formal ERM process that is in place (Caldwell, 2012; Ormazabal et al., 2010).

The responsibility for risk oversight should be allocated to a specific board committee, like a risk management committee (RMC) (Ishak & Mohamad Nor, 2017). The RMC is a self-governing committee of the board of directors, whose sole and limited purpose is to be accountable for the risk management strategies of the Corporation's operations and oversight of the operation of the corporation's risk management outline. RMCs play a significant role in the risk determination and realisation process and advise the board of directors on what actions to take for the betterment of the organisation. Moreover, they play an integral role in assisting the board to fulfil its oversight role as per the extent of their risk appetite and risk management compliance, as well as governance. The formation of the RMC is significant in improving the supervision of risk oversight and to substantiate legitimacy over risk management (Hines & Peters, 2015) through better form performance (Jia & Bradbury, 2020). Therefore, the characteristics of the RMC influences the firm's risk oversight.

Board Effectiveness

Past research on board effectiveness has referred to traditional theories of corporate governance, such as Agency, Stewardships, and Resource Dependence Theories (Abdullah & Valentine, 2009; Kiel & Nicholson, 2003; Yusoff & Alhaji, 2012). These theories aim for corporate governance mechanisms from the shareholders' perspective, in which the board of directors is the ruling body in an organisation that is formed to increase shareholder value and protect shareholder interest (Charreaux & Desbrières, 2001). The research argues,

therefore, that board effectiveness depends on the board's characteristics and it contributes to the company's financial performance (Al-Matari, Al-Swidi, Fadzil, & Al-Matari, 2012; Bathula, 2008; Garcia-Torea, Fernandez-Feijoo, & Cuesta, 2016; Guest, 2009; Johl, Kaur, & Cooper, 2015). In addition to the perspective of shareholders, boards should also make sure that stakeholder interest in the organisation is taken care of, with the organisation's overall benefit being the key thing to take into consideration (Ayuso, Rodríguez, García-Castro, & Ariño, 2014). The board of directors are the decision-makers who determine the operations of the whole organisation. In their decision-making process, they consider the organisation's policies and objectives and monitor its overall direction (Garcia-Torea et al., 2016). Risk oversight is one of the primary functions of the boards.

From a risk management perspective, the primary role of the board of directors regarding ERM is the risk oversight function (Viscelli, Beasley, & Hermanson, 2016). De Lacy (2005, p.17) stated that "the whole area of contemporary corporate governance swings on the complexity of the risk and the understanding of the risk by the board." The board's role is to ensure the effectiveness of the ERM program. Also, Ittner and Keusch (2015) found there is a positive, significant relationship between board oversight and risk management maturity.

Board effectiveness is related to company outcomes (Adams, Hermalin, & Weisbach, 2010). The board's characteristics can be determined by its effectiveness from the shareholders' perspective (Garcia-Torea et al., 2016), which can be divided into three groups: internal functioning, size, and composition.

Board size is typically used as a measurement of both the monitoring and advisory roles (Nicholson & Kiel, 2004). The previous literature saw that the relationship between board size and board efficiency could be both positive and negative, and they are different for different nations. In Thailand, corporate governance guidance recommends that the size of boards is 5 to 12 members. Huge boards may be more proficient in handling the business more efficiently (Baulkaran & Bhattarai, 2020) and monitoring powerful management more effectively (Ujunwa, 2012). On the other hand, bigger boards cannot be much more efficient due to the "free-riding" problem (Golden & Zajac, 2001; Jensen, 1993), as they lead to slower decision making (Ruigrok, Peck, & Keller, 2006) and are less cohesive (Mueller & Barker, 1997). In terms of board size and performance, previous research also found both positive (Huse, Nielsen, & Hagen, 2009; Judge Jr & Zeithaml, 1992; Kalsie & Shrivastav, 2016) and negative (De Andres, Azofra, & Lopez, 2005; Guest, 2009) relationships. In fact, on this question, Dalton, Daily, Johnson, and Ellstrand (1999) pointed out that the ideal size of the board appears to depend on numerous business aspects, such as the size of the business, diversification, and internationalisation.

There are five main issues mentioned in the literature on board composition: outside directors, managerial ownership, CEO duality, board experience, and gender. Regarding

outside directors, the boards with more outside directors are better at monitoring management (Helland & Sykuta, 2005). There are many studies that support outside directors or refer to the ability of independent directors and the monitoring performance of the board (Kim, Mauldin, & Patro, 2014; Peasnell, Pope, & Young, 2005; Suchard, Singh, & Barr, 2001) to protect shareholders' interests. Regarding the performance aspect, Peasnell, Pope, and Young (2000) concluded that the high monitoring tendency of outside directors is related to the aspect of financial reports, while Duchin, Matsusaka, and Ozbas (2010) point out that the effectiveness of outside directors depends on the cost of information. When the information cost is low, the performance of outside directors increases. Meanwhile, managerial ownership implies that the relationship between the managers and shareholders of listed firms can lead to an agency problem (Jensen & Meckling, 1976). Cheng, Su, and Zhu (2012) proposed that managerial ownership and the level of board monitoring are compensated to handle the agency problem. Higher managerial ownership may cause a problem between shareholders and bondholders that is related to risk-taking. However, increasing managerial ownership can motivate management to focus on improving the firm's performance rather than just benefiting themselves. Chen and Steiner (1999) pointed out that managerial ownership is a significant determinant of risk management. Also, the significance of the risk equates to the amount of managerial ownership there is, while the association between managerial ownership and company performance still lacks consistency, as it has both a significant positive (Li, Moshirian, Nguyen, & Tan, 2007; McConnell & Servaes, 1990) and negative (Mandacı & Gumus, 2010; Wang & Shailer, 2015) effect.

Furthermore, CEO duality refers to the CEO being the chairperson of the board of directors. CEO duality is an important element of board effectiveness. As per the agency theory and stewardship theory, it is better to separate the chairman and the CEO as it leads to a better, more efficient balance, as well as the cross-checking of both roles (Ow-Yong & Guan, 2000) and it avoids substantial power being invested in the same person, as boards have independently monitored the management (Hashim & Devi, 2008). Furthermore, board experiences are the main board composition for effective oversight. Maria (2012) points out that the financial background of the board is linked to firm performance. Similarly, Lone, Ali, and Khan (2016) saw that the board's knowledge and experience improved the disclosure of corporate social responsibility.

Additionally, there is plenty of empirical evidence and interest in gender and corporate governance mechanisms, which is a discussion that leads to increased board effectiveness. Bear, Rahman, and Post (2010) point out that gender diversity on the board is related to efficient monitoring and they believe the women on boards should be increased. The increase of female representatives on boards is also significant to a company's financial statement (Martinez-Jimenez, Hernández-Ortiz, & Fernández, 2020) and it results in the stock market

return being less variable (Lenard, Yu, York, & Wu, 2014). Moreover, there is a positive association between having a female chair of the board and company performance (Hoobler, Masterson, Nkomo, & Michel, 2018; Peni, 2014) and it also relates to board effectiveness (Terjesen, Couto, & Francisco, 2016). However, Singhathep and Pholphirul (2015) found that female CEOs can have a negative effect on both the short-term and long-term financial performance of manufacturing companies in Thailand. When it comes to being risk-averse, female CEOs and chairs are more conservative about taking risks than men (Harrant & Vaillant, 2008), are-risk sensitive about gains and losses (He, Inman, & Mittal, 2008).

Board meetings and board committees are crucial in the inner functioning of board effectiveness. They are usually used to replace the board's number of administrative activities. The number of board meetings reflects the board's varied involvement in the monitoring process across the company (Brick & Chidambaran, 2010). It also influences strategy decisions (McNulty & Pettigrew, 1999) and enhances risk management practices (Abdul, Noor, & Ismail, 2013). The frequency of board meetings helps the board to direct, manage, and monitor more effectively and has led to better financial performance (Ntim & Osei, 2011). Moreover, the corporate governance best practices in different countries recommend that an organisation could form several committees to help the board handle several specific issues that lead to an improvement in the board's effectiveness (DeZoort, Hermanson, Archambeault, & Reed, 2002). These may range from board committees that handle specific areas of the organisation to the internal management of committees within the organisation. De Lacy (2005) referred to this as where the real work of a board is done. These committees are usually composed of members of the organisation who have come together and focused on a single issue that is affecting the whole organisation. Christensen, Kent, and Stewart (2010) refer to it as the adoption of board sub-committees, such as the nomination committee and remuneration committee to improve monitoring and enhance market and accounting performance. Klein (1998) and Weir & Laing (2000) have also argued that subcommittees have a positive impact on performance.

Based on the discussion above, there are three main components, including 10 variables of board composition, which combine to provide board effectiveness from the shareholders' perspective and risk management from a different perspective; therefore, this study expects that the board's effectiveness will affect risk oversight. The first hypothesis proposed is as follows:

Hypothesis 1: Board effectiveness is positively linked with the risk oversight

Audit Committee Effectiveness

The audit committee is a subcommittee of the board that is in charge of overseeing any oversight on financial reporting and its disclosure. In Thailand, the audit committee is a

compulsory committee with a minimum of 3 independent members who assist the entire board of directors in fulfilling the corporate governance requirement on the audit functions and the organisation's financial reporting in the risk management system. The main responsibility of the audit committee is to understand the producers and processes of the organisation's risk management, and consequently, offer to set a roadmap or, rather, an assurance programme to make sure that the risks facing the organisation are covered, controlled, or minimised (Brown, Steen, & Foreman, 2009). Equally, the committee should assess the independence of the risk management function in an organisation. The audit committee plays an important role in ERM implementation (Cohen, Krishnamoorthy, & Wright, 2017) and should assist the risk oversight roles (Subramaniam, Carey, Zwaan, & Stewart, 2011). In addition, audit committee effectiveness is linked to both controlling and monitoring risk management effectiveness (Alzharani & Aljaaidi, 2015). However, there are arguments that risk management oversight should be independently allocated to the risk management committee instead of the audit committee responsible (Yatim, 2009). Also, due to a lack of proficiency and time, it is irrational to assume that an audit committee will respond to risk management effectiveness and the conduct of corporate governance (Zaman, 2001).

The audit committee's effectiveness can be determined from its various characteristics. Different audit committee characteristics are affected by how the company manages its risks. For example, an audit committee meeting will significantly increase risk management acceptance (Abdullah, Shukor, & Rahmat, 2017). The size of the audit committee is positively linked to risk management activities (Alzharani & Aljaaidi, 2015). Moreover, Cohen et al. (2017) indicated that the experiences of audit committees are linked to ERM and financial reporting. In addition, the independence of the audit committee has a positive effect on the quality of ERM (Pérez-Cornejo, de Quevedo-Puente, & Delgado-García, 2019). Therefore, this study expects audit committee effectiveness to have a positive effect on risk oversight.

Hypothesis 2: Audit Committee effectiveness is positively linked to the risk oversight

Measurement and Structural Models

The literature review leads to the proposed conceptual model in Figure 1 being advanced, as follows:

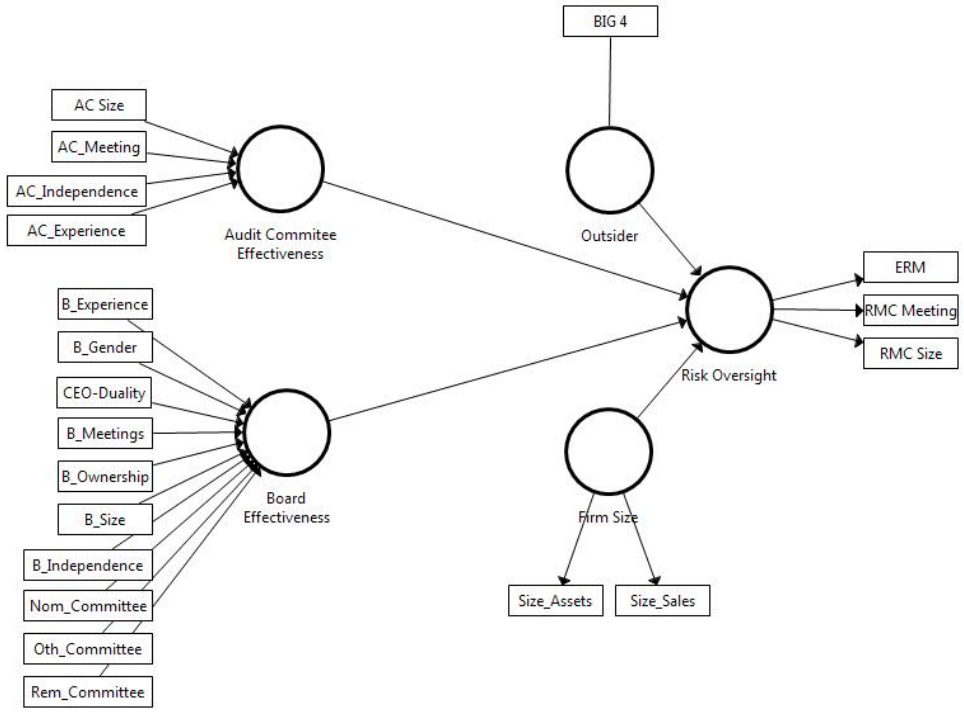

Figure 1 Measurement and structural models

Research Methodology

Sample and Data Collection

This study considers the effect of board characteristics on risk oversight by considering firm-specific characteristics. Information on board characteristics, audit committee characteristics, risk management oversight, and financial information was collected from www.setsmart.com, DATASTREAM and the individual company's data. This is documented in Form 56-1, the Annual Reports, and the firms' websites.

This study employs secondary data, which is cross-sectional data. The population was sampled from businesses registered on the Stock Exchange of Thailand (SET) between 2015 and 2017. This study chose 2017 as the ending year for the data as all the companies in the sample followed a similar version of the corporate governance guidelines during that year. The most recent guidelines were released in 2007 and applied to the listed companies in the following year.

The population consisted of all 753 listed companies in the SET. This study excluded 160 companies from the Market for Alternative Investment (MAI), an alternative stock market for small and medium-sized enterprises since MAI firms are smaller and ERM disclosures are not be comparable to the SET firms. An additional 149 companies under the financial sector, property fund, real estate investment trusts and firms under rehabilitation. Finally, 132 observations of listed companies were dropped as missing data on risk oversight disclosure, financial data and outliers. This study included companies that had data on all of the variables for a minimum of one year in the final sample. Therefore, the final sample included 1,200 firm-year observations between 2015-2017. Table 1 provides information about the final sample's observations.

Table 1 Final sample

	Sample	
Number of Thai listed firms	753	firms
Less MAI firms	160	firms
Firms in the financial industry	60	firms
Property funds and REITs	66	firms
Firms in rehabilitation	23	firms
Remaining firms	444	firms
Multiply 3 years (2015-2017)	3	years
Total	1,332	firm-years
Fewer observations with missing data	132	firm-years
Final sample	1,200	firm-years

Dependent Variable (Measuring Risk Oversight Disclosure)

Risk oversight is the dependent variable. It is considered both the ERM implementation aspect (Beasley, Branson, & Hancock, 2009) and the risk management committee effectiveness aspect (Wu, Kweh, Lu, & Azizan, 2016) and is used to measure the risk oversight variable. All publicly available information was evaluated for each company (Form 56-1, the Annual Report and from the firm's websites) for the disclosure of evidence of both ERM implementation and risk management committee effectiveness.

For the first aspect, a dummy variable is used to show if a company is engaged in ERM. ERM disclosure approaches rely on a proxy of ERM, such as "enterprise risk management", "chief risk officer", "risk committee", "strategic risk management", "consolidated risk management", "holistic risk management", or "integrated risk management.", for ERM implementation to indicate whether risk management has been implemented in the companies. Content analysis has better validity and larger scope in

the disclosure research (Milne & Adler, 1999). Moreover, the content analysis makes certain the repetitiveness and valid indication from the data (Krippendorff, 2018). This method has been used in many previous findings (e.g. Eckles, Hoyt, & Miller, 2014; Hoyt & Liebenberg, 2011; Liebenberg & Hoyt, 2003; Pagach & Warr, 2010). ERM has dummy variables that take the value of 1 if an ERM is present.

The second aspect, risk management committee effectiveness, is considered to be based on the risk management characteristics that contribute to managing and monitoring corporate risk. The attributes follow a prior study carried out by Wu et al. (2016) and Ng, Chong, and Ismail (2013) that included the number of directors in the group and the occurrence of meetings per year.

Therefore, risk oversight disclosure is the consideration of three features that evaluate the content and eminence of risk management disclosure, including ERM implementation, the number of risk management committee meetings, and the size of risk management committee meetings gathered in a single variable.

Independent Variables

This study examines two sets of independent variables. The first is board effectiveness. From the literature review, a determinative measurement model used board features to identify board efficiency as pointers. The formative indicators of board characteristics consist of ten variables: board size (B_Size), outside directors (B_Independence), CEO duality (CEO-Duality), frequency of board meetings (B_Meetings), board experience (B_Experience), the gender of the chairperson of the board (B_Gender), managerial ownership (B_Ownership), nomination committees (Nom_Committee), remuneration committees (Rem_Committee), and other board sub-committees (Oth_Committee). The first four board characteristics variable measure are followed by Subramaniam et al. (2009) and Abdulsamad, Yusoff, and Lasyoud (2018). The board experience and gender of the chairperson of the board measure follows García-Ramos and García-Olalla (2011) and the managerial ownership measure is similar to Bathula (2008) and Jermias and Gani (2014). Lastly, the latest three variables are about the existence of board sub-committees, e. g. the nomination committee, remuneration committee, and other board sub-committee measures that are similar to Carson (2002) and Liu, Harris, and Omar (2013).

The second independent variable is audit committee effectiveness, which is also a formative measurement model that uses audit committee characteristics as its indicators. The audit committee effectiveness measure is followed by Yatim (2009) and consists of four audit committee variables: audit committee size (AC_Size), frequency of audit committee meetings (AC_Meeting), audit committee independence (AC_Independence) and audit committee experience (AC_Experience). The description of the independent variable is shown in Table 2.

Table 2 Block of pointers for each construct as well as their meaning

Construct/indicator	Definition
Risk Oversight	
Enterprise Risk Management (ERM)	ERM are dummy variables, which take the value of 1 if an ERM involvement is there
Risk Management Committee Meeting (RMC Meeting)	The number of risk management committee meetings per year
Risk Management Committee Size (RMC Size)	The total number of risk management committees
Audit Committee effectiveness (formative construct)	
Audit Committee Size (AC_Size)	The total number of audit committees
Audit Committee Meetings Frequency (AC_Meeting)	Per year audit committee meetings
Audit Committee Independence (AC_Independence)	The ratio of independent directors to total audit committees
Audit Committee Experience (AC_Experience)	The ratio of audit committee members with finance and accounting qualifications
Board Committee effectiveness (formative construct)	
Board Size (B_Size)	The total number of board of directors
Outside Directors (B_Independence)	The ratio of independent directors to total directors on the board of directors
Managerial Ownership (B_Ownership)	The percentage of controlling shareholders owned by the Chief Executive Officer (CEO). The data collected from direct shareholding
CEO Duality (CEO-Duality)	When the CEO also serves as the Chairperson of the board (COB) in one person. CEO duality can be measured as a dummy variable, coded 1 if the CEO is the COB as well and 0 in the other scenario
Frequency of Board Meetings (B_Meetings)	The number of the board of directors meetings per year

Table 2 Block of pointers for each construct as well as their meaning (Continued)

Construct/indicator	Definition
Board Experience (B_Experience)	The ratio of the directors having experience of accounting and/or finance to total directors on the board
Gender of the Chairperson of the Board (B_Gender)	Gender of the COB is measured as a dummy variable coded 1 for firms with male COB and 0 in another case
Nomination Committee (Nom_Committee)	Nom_Committee are dummy variables that take on the value of 1 if a nomination committee is present
Remuneration Committee (Rem_Committee)	Rem_Committee are dummy variables that take on the value of 1 if a remuneration committee is present
Other Board's Sub-Committees (Oth_Committee)	Oth_Committee are dummy variables that take the value of 1 if the board had sub-committees except audit committee, risk management committee, nomination committee and remuneration committee
Outsider (reflective construct)	
Big 4 audit firm	BIG 4 is a dummy variable, which takes the value of 1 if the auditor is a Big 4 audit company
Firm size (reflective construct)	
Assets (Size_Assets)	Average logarithm of the total assets of the company during the time
Sales (Size_Sales)	Average logarithm of the total sales of the company during the time

Control Variables

Moreover, this study includes additional control variables for other attributes of the firms that could affect the risk oversight applied by Garcia-Torea et al. (2016). The control variables include the outsider variable and firm size variable. Previous research has shown that the Big 4 auditing firms and the enterprise risk management implementation levels have a significant positive effect (Beasley, Clune, & Hermanson, 2005). The auditor's expertise helps the growth of corporate governance as it is a Big 4 audit firm (Al-Sartawi & Sanad, 2019). Therefore, the outsider variable is a reflective construct referred to as a Big 4 audit firm (Big 4), a dummy variable, which takes on the value of 1. In this case, the auditor is a Big 4 audit firm.

Previous research has proved that the size of a company has a positive influence on ERM implementation (Beasley, Pagach, & Warr, 2008; Hoyt & Liebenberg, 2011; Lin, Wen, & Yu, 2012). The bigger businesses seem to need a more enhanced risk management system from the economies of scale and the complexity of risk. This study follows previous research when it was applied as an indicator of company size, the average logarithm of the total assets

(Size_Assets) and sales (Size_Sales). This study uses a reflective measurement model to represent the behaviour of the control variables.

Statistical Analysis

Structural Equation Modeling (SEM) with Partial Least Squares (PLS) is used to test the influence of board effectiveness and audit committee effectiveness on the risk oversight aspect. SEM is a multivariate data analysis method used to test multiple relations between the independent and dependent underlying variables with data from visible indicators (Richter, Cepeda-Carrión, Roldán Salgueiro, & Ringle, 2016). The major benefit of the SEM technique is that it is not sensitive to the problems of population, residual distribution, and the scale of measurement (Lacobucci, 2010; Lei & Wu, 2007). Normally, SEM can be analysed using two techniques, which are covariance-based approaches and variance-based approaches (Astrachan, Patel, & Wanzenried, 2014; Reinartz, Haenlein, & Henseler, 2009). A PLS regression, a variance-based method for data analysis, is suitable for this study. The reason for using PLS in this study is that it uses soft modelling to build a prognostic model when there are numerous variables, which are extremely collinear with a dependent variable (Hair, Ringle, & Sarstedt, 2013; Henseler, Ringle, & Sinkovics, 2009). This research constructs the formative latent variable, which can be demonstrated using a PLS. Moreover, PLS-SEM does not require a correct model specification, which makes it an appropriate method for a large sample, and PLS focuses on the predictive accuracy of the dependent variable; therefore, it is better to use a causal-predictive approach (Shmueli et al., 2019). The PLS regression study was carried out using SMART PLS 3.0 software established by Christian Ringle and the team at the University of Hamburg in Germany (Ringle, Wende, & Becker, 2015).

Results and Discussion

Descriptive Statistics

Table 3 shows the statistics of the sample of 1,200 firm-year observations throughout 2015-2017 for all the variables. It does this by showing the minimum, maximum, average, and standard deviation of data. Regarding risk oversight, 53.2 percent of Listed companies in Thailand have implemented ERM. On average, there are three risk management committee meetings and two risk management committee meetings were held during the period.

Regarding board effectiveness, boards had an average of ten directors, whereas the minimum size was around five. The results are consistent with the corporate governance code for Thail listed companies, which states that the size of a board should be at least five directors and not be more than 12 directors. However, board size depends on the company's size and the complexity of their operation. Eight board of directors meetings are held on average during the year (a minimum of 2 and a maximum of 36). With regards to the gender of

the chairperson of the boards, a large majority (93.6 percent) had male directors. Independent directors made up 41 percent of the board and executive directors made up 59 percent. This is in agreement with the CG code that, overall, a minimum of one-third of the directors on boards should be independent directors. The number of directors who had accounting and/or finance background totalled 50 percent, and the percentage of controlling shareholders owned by the Chief Executive Officer (CEO) or managerial ownership was, on average, 7.8 percent.

Most of the boards had established a nomination committee (70.5 percent) and remuneration committee (70.9 percent). In addition, 47.1 percent of the companies had formed other board sub-committees to fulfil their role and responsibilities, e.g. the corporate social responsibility committee, sustainable development committee, corporate governance committee, human resource management committee, investment committee, etc.

Table 3 Descriptive summary of the indicators

	Mean	**Standard deviation**	**Minimum**	**Maximum**
ERM	0.532	0.499	0.000	1.000
RMC Meeting	1.798	3.088	0.000	25.000
RMC Size	2.617	3.180	0.000	15.000
AC_Size	3.153	0.547	3.000	6.000
AC_Experience	0.486	0.254	0.170	1.000
AC_Independence	0.987	0.068	0.667	1.000
AC_Meeting	5.833	3.308	1.000	43.000
B_Experience	0.503	0.184	0.070	1.000
B_Gender	0.936	0.245	0.000	1.000
B_Independence	0.410	0.091	0.250	0.800
B_Meetings	7.737	3.711	2.000	36.000
B_Ownership	7.808	12.589	0.000	76.920
B_Size	10.250	2.418	5.000	21.000
CEO-Duality	0.208	0.406	0.000	1.000
Nom_Committee	0.705	0.456	0.000	1.000
Oth_Committee	0.471	0.522	0.000	1.000
Rem_Committee	0.709	0.454	0.000	1.000
BIG 4	0.617	0.486	0.000	1.000
Size_Assets	9.814	0.656	8.470	12.350
Size_Sales	6.636	0.707	4.014	9.315

Regarding audit committee effectiveness, the mean percentage of independent directors on the audit committee was 98.7%. The average number of directors in the audit committee was three, whereas the average number of directors with accounting and finance

qualifications who were members of the audit committee was about half (48.6 percent) of the total number of audit committee directors. Lastly, there were about six audit committee meetings arranged over the course of the year. The results of this study are in line with SET's best practice rules for audit committees, which pointed out that an audit committee should consist of at least 3 independent directors, including at least 1 committee director with knowledge of accounting and finance.

Finally, for the control variables, the logarithms of assets and sales were 9.814 and 6.636. On average, 61.7% of the sample used the Big 4 auditors (the large international audit firms).

The Measurement Model

Reflective Constructs (Risk Oversight, Firm Size, and Outsider)

This research used the technique suggested by Bollen and Lennox (1991) and Diamantopoulos and Siguaw (2006), which is the measurement model assessment construct reliability and validity. The most common measure of a reliability coefficient is Cronbach's alpha. Cronbach's alpha is a degree of internal constancy of a multi-item scale. The coefficient of correlation varies from 0 - 1.00. Alpha coefficients should be more than or equal to 0.80 for a good scale, 0.70 for a satisfactory scale, and 0.60 for a scale for examining resolves (Hair et al., 2013). Cronbach's alpha in this sample is that the risk oversight variable is 0.825 and the firm size is 0.831. Therefore, these variables are reliable.
The composite reliability is a preferred alternative technique for testing the scales' dependability. Composite reliability can range from 0 to 1, with 1 being the higher score indicating better projected reliability. In a model that is suitable for investigative resolves, the value must be over 0.6 (Raykov, 1997) and should be over 0.7 for a model for positive resolutions (Henseler, Hubona, & Ray, 2016). The coefficient of reliability calculated in this sample shows that risk oversight equals 0.896 and firm size is 0.921, indicating that the variable has superior dependability, satisfactory content, and construct cogency. (Hair et al., 2013). Furthermore, the Average Variance Extracted (AVE) evaluated the average variance by the factor created, which may be used as a test of both convergents as well as divergent validity. The AVE should be a minimum of 0.5, which means 50% of the measurement variance was taken by the model. If it is higher, this specifies an adequate degree of convergent validity (Chin, 1998). An AVE less than 0.50 means that error variance is more than the explained variance. The AVE replicates the average commonality for every latent aspect of a reflective model. The outcome shows the AVE value of risk oversight (0.743) and firm size (0.853). Thus, this variable shows there to be adequate convergent validity.

Moreover, Table 4 provides the discriminant validity of the reflective constructs (Lucas, Diener, & Suh, 1996). It demonstrates that the different constructs are different from the others. Discriminant validity is the square root of AVE and it should be bigger than the correlations of the constructs and the others in the model. The result shows that the discriminant validity is there and it therefore offers adequate convergence, cogency, and internal consistency reliability.

Table 4 Discriminant validity of the reflective constructs

	(1)	(2)	(3)	(4)	(5)
(1) Audit Committee Effectiveness	N/A				
(2) Board Effectiveness	0.268	N/A			
(3) Firm Size	0.286	0.345	0.924		
(4) Outsider	0.065	0.142	0.303	1	
(5) Risk Oversight	0.261	0.496	0.256	0.074	0.862

Formative Construct (Board Effectiveness and Audit Committee Effectiveness)

Possible multicollinearity among the indicators should be considered because the independent variables should be independent (Farrar & Glauber, 1967). Hair (2009) stated that the multicollinearity can be tested through the test variance inflated factor (VIF) which has a threshold of 10. Therefore, VIF is calculated by using SPSS v.21 to test the multicollinearity between the formative pointers. As shown in Table 5, there is no multicollinearity in this study because the maximum VIF (7.216) is less than the threshold of 10.

The next stage of this study considered the weights of the decisive pointers. The greater the weight, the more effective it is in building the construct. The indicators weight was calculated through the regression, based on the latent variable scores with the determinative indicators being independent variables (Hair et al., 2013). Table 5 shows that all the audit committee variables (AC_SIZE, AC_Meeting, AC_Independence, and AC_experience) significantly contribute to the construct audit committee's effectiveness. For the board effectiveness construct, seven pointers help considerably with the construct and there are three indicators (B_Gender, B_Ownership, and CEO-Duality) with no significant weights. Henseler et al. (2009) state that the pointers with no noteworthy weights must not be eliminated if their inclusion is reasonable. Therefore, this study includes the three indicators that have no significant weight due to these variables being supported by the previous research.

The Structural Model

The structural model is evaluated using the R^2 values as well as the importance of the path constants of the exogenous variables. The valuation of the structural model is vital in

deciding how well the empirical data backs the model's construct; therefore, the analysis aims to observe the model's predictive relevancy and relationships between the dependent variable as well as the independent variables. In this research, the risk oversight constructs as the dependent variable have an R^2 value of 0.268, which is valid (Henseler et al., 2009). Conversely, the outcome shows that the four independent concepts considerably clarify 26.8% of the variance. The outcomes of the structural model are shown in Figure 2.

To examine the significance of the path coefficients and T-statistics values, a bootstrapping process that utilises 5,000 subsamples was performed for this research, as shown in Table 6. In hypothesis 1, it projected that the board effectiveness issue would considerably and certainly affect risk oversight considerably (path = 0.439, t-value = 17.871, $p < 0.01$). Hence, hypothesis 1 is accepted. Moreover, the audit committee effectiveness factor would considerably and certainly affect the risk oversight. The audit committee effectiveness factor was positive, as well as significant (path = 0.123, t-value = 4.148, $p < 0.01$), and supported hypothesis 2. Similarly, the finding provided empirical support firm size significantly affecting the risk oversight (path = 0.076, t-value = 2.872, $p < 0.01$). Lastly, the result showed that the outsider (Big 4) variable was negative and insignificant to the risk oversight (path = -0.019, t-value = 0.931).

The greater the path coefficient, the stronger the result of the independent variable on the dependent variable. This result indicates that board effectiveness has the most important effect (path = 0.439), followed by audit committee effectiveness (path = 0.123). Both variables have a significant, positive influence on the risk oversight of the companies. Although firm size had a significant effect on risk oversight, it had the least effect on risk oversight (path = 0.076).

Table 5 Study of formative and reflective measurement models

Construct	Formative		Reflective			
	Indicator level		Reliability			
	VIF	Weight	Loading	C. Alpha	reliability	AVE
Risk Oversight				0.825	0.896	0.743
ERM			0.912			
RMC Meeting			0.781			
RMC Size			0.887			
Audit Committee Effectiveness				N/A	N/A	N/A
AC_Size	1.146	0.402**	0.284			
AC_Experience	1.024	0.288**	0.279			
AC_Independence	1.124	0.326**	0.242			
AC_Meeting	1.006	0.834**	0.872			
Board Effectiveness				N/A	N/A	N/A
B_Experience	1.027	0.123**	0.152			
B_Gender	1.009	-0.048	-0.009			
B_Independence	1.095	0.042*	0.122			
B_Meetings	1.066	0.164**	0.292			
B_Ownership	1.094	0.067	-0.042			
B_Size	1.184	0.198**	0.352			
CEO-Duality	1.105	0.052	-0.077			
Nom_Committee	7.198	0.138**	0.783			
Oth_Committee	1.082	0.466**	0.666			
Rem_Committee	7.216	0.542**	0.825			
Firm Size				0.831	0.921	0.853
Size_Assets			0.945			
Size_Sales			0.902			
Outsider				1	1	1
BIG 4			1			

Note: N/A: not applicable.

Weight significant at ** $p < 0.01$, * $p < 0.05$

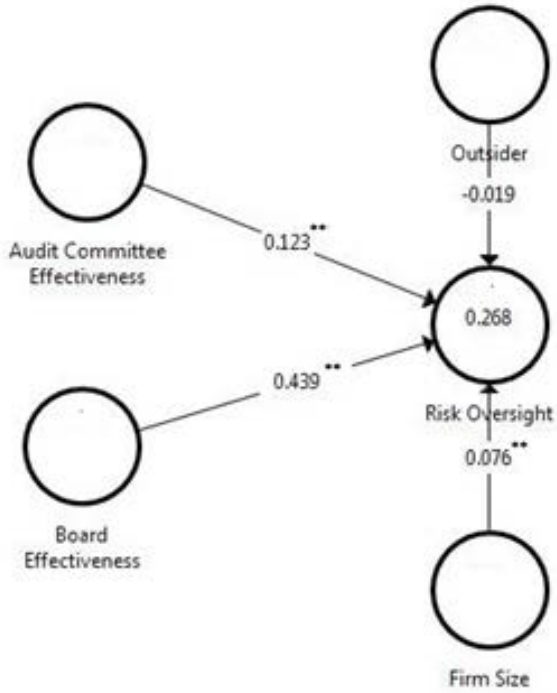

Figure 2 Structural model results. ** p < 0.01, * p < 0.05

Table 6 Effects on Risk Oversight

Exogenous variable	**Path coefficient**	**t-value (bootstrap)**	**Test Results**
Audit Committee Effectiveness	0.123	4.148**	*Supported*
Board Effectiveness	0.439	17.871**	*Supported*
Firm Size	0.076	2.872**	*Supported*
Outsider (BIG 4)	-0.019	0.931	*Non-Supported*
N		1,200	
R Square Adjusted		26.54%	
Chi-Square		1255.702	
AIC		-365.038	

** p < 0.01, * p < 0.05

Discussion

The main results revealed that board efficiency is both positive and important to risk oversight. This result is consistent with De Lacy (2005) and Viscelli et al. (2016), who stated that the board of directors plays a crucial part in achieving effective risk oversight. The result also supported the board's effectiveness with regard to the shareholder's perspective of corporate governance. Similarly, Charreaux and Desbrières (2001) point out the need to protect shareholder interest. The role of the board is vital to the core of risk oversight, which is linked to governance, policy, and assurance of the betterment of the organisation. The ideal features of the board of directors are crucial to the company's risk management system. The finding reinforces the need for companies to make sure that the risk management process effectively monitors and brings about risk oversight as an important part of the board's agenda to ensure that the board encourages responsibility for unacceptable risks.

Regarding the board characteristics, this study found that seven indicators (board size, outside directors, frequency of board meetings, board experience, nomination committee, remuneration committee and other board sub-committees) significantly contribute to board effectiveness, which is also linked to risk oversight. The result is consistent with Garcia-Torea et al. (2016), who stated that the following was a measure of board effectiveness and were found to be significant: board size, outside directors, frequency of board meetings, board experience, and board sub-committees with a stakeholder's perspective. However, Garcia-Torea et al. (2016) found that board size and board experience have a significantly negative effect on board effectiveness from a stakeholder's perspective, which is inconsistent with this study results. Regarding board size, the results support larger boards, which is consistent with Baulkaran and Bhattarai (2020) and Ujunwa (2012), who stated that larger boards have a wide range of experience and can efficiently monitor the risk management program. Concerning outside directors, the results are consistent with Kim et al. (2014), Peasnell et al. (2005) and Suchard et al. (2001) who supported independent directors and the monitoring performance of the board. Therefore, the greater monitoring frequency of outside directors on the boards is related to the oversight aspect of protecting the shareholder's interest. Moreover, the frequency of board meetings is an important factor in the function of board effectiveness. This result agrees with that of Ntim and Osei (2011) and enhances risk management practices (Abdul et al., 2013). Number of boards meeting can reflect the difference between board involvement and the monitoring process across the companies. Furthermore, this study found board experience is an essential part of the composition of the board. This result is consistent with Maria (2012), who found there is a relationship between board experience and firm performance. Lastly, the establishment of board sub-committees, such as the nomination committee, remuneration committee and

other board's sub-committees represents the quality of board effectiveness. The results confirm the arguments of Klein (1998) and (Weir & Laing, 2000), which supported the presence of a subcommittee and that monitoring should be done to enhance the monitoring of the risk management process.

Moreover, this study has established that the audit committee's effectiveness is certainly significant to risk oversight. This result is consistent with Zaman (2001) that the audit committee is important to the monitoring function and it makes sure that risk is effectively managed within the risk appetite. This result also relates to the audit committee's effectiveness, which is crucial to the implementation of the ERM program (Cohen et al., 2017) and important in confirming that risk oversight in the companies has been well-established (Subramaniam et al., 2011). Therefore, when there is a risk management committee that is accountable for the overall risk management system and policies for risk governance, the audit committee still has an important role to confirm that risk management and controls are in place and well-established. Additionally, the audit committee features, including the size of the audit committee, frequency of the audit committee meetings, independence of the audit committee, and audit committee experience, are positively significant to the effectiveness of the audit associated with risk oversight. Furthermore, the results agree with the results of Yatim (2009) that explored the relationship of the audit committee features of a Malaysian listed firm and the level of risk oversight. Thus, the audit committee composition can enhance risk management implementation and it tends to back formal risk management practices that comprise the formation of a risk management committee.

This study has shed further light on other related variables, such as size, the Big 4 audit firms, and the relationship between board characteristics and risk oversight. It was found that size directly impacted the level of risk oversight. A larger business size can make the monitoring process more effective to handle risk from resource management, economies of scale and a better risk management system. This result is consistent with most of the previous studies which found that the adoption of the ERM system is positively related to the size of a firm (Beasley et al., 2008; Hoyt & Liebenberg, 2011; Lin et al., 2012). Meanwhile, the results showed that the Big 4 auditing firms and risk oversight have no significant effect. The large outsider audit firms cannot guarantee an improvement in company risk oversight. It seems that board effectiveness and audit committee effectiveness can be considered to be the main responsibility that increases the level of risk management monitoring in the firm.

Conclusion

This research studied whether board effectiveness and audit committee effectiveness are linked to risk oversight of a company. Therefore, this study has crafted a way of achieving board efficiency and audit committee efficiency on the basis of a

shareholder's viewpoint and analysed whether this is also related to the risk oversight of a company. Meanwhile, risk oversight measures have been studied from the evidence of ERM implementation and risk management committee effectiveness, which are factors that show there is effective risk oversight. This study used a structural equation model which was assessed by a PLS regression to find out if the relationship between board effectiveness and audit committee effectiveness was related to risk oversight. The research included 1,200 samples from Thai-listed companies from 2015 to 2017. The results display that board effectiveness and audit committee effectiveness are positively significant to risk oversight of a company. Moreover, larger companies are linked to risk oversight, as they have more resources to efficiently monitor risk management systems, while the Big 4 auditor does not influence effective risk oversight in the firm.

This research's contribution can be separated into two main parts. Firstly, the study makes an important contribution to both the corporate governance and the risk management literature. Regarding risk management and the corporate governance structure, there is an intercorrelation between the characteristics of the board of directors and audit committee when it comes to the characteristic of risk oversight and how the firm gains the effective monitoring of the risk management system. Secondly, this study attempted to measure audit committee effectiveness holistically, which is similar to using the elements to determine board effectiveness. The measurement model uses the characteristics of the boards and audit committees found in the previous literature.

Moreover, the result of this research may aid regulatory policymakers, shareholders, and company directors by guiding them toward making proper choices about their board and audit committee. There are board characteristics that drive its effectiveness, such as size, outside directors, frequency of meetings, the experience of its members, the nomination committee, remuneration committee, and other board sub-committees. Moreover, the audit committee's features include the size of the audit committee, audit committee meetings frequency, and audit committee experience, as audit committee effectiveness was found to have a significant effect on audit effectiveness that is associated with risk oversight. In Thailand, listed companies are required to appoint an audit committee, while other board committees are non-compulsory. This study suggests specific characteristics that affect the effectiveness of boards and the audit committee. Also considered is the establishment of a board sub-committee to propose an appropriate person to help board oversight and protect shareholder interest.

This study has some limitations. First, the risk management data was gathered by voluntary disclosure. The data in this study used secondary data collected from an annual report and related documents to determine the ERM variables that rely on proxies of the ERM keyword. The data gathering from the survey method is likely to increase understanding of

ERM implementation in the firm and ERM measurement could be ranked at a different level. Second, this study uses a single variable to determine board effectiveness and audit committee effectiveness. A survey to gain in-depth meaningful data could be used to assess board and audit committee effectiveness. Lastly, the data collection in this study was from 2015 to 2017 due to the consistency of the CG Code, which is pre-CG code of 2017. Therefore, the results cannot be extended to other periods as the results might differ from time to time.

These limitations could help to direct future research. The survey method might be an alternative method of collecting data from all listed companies in Thailand. The ERM measurement can determine the different levels of ERM implementation. The establishment of a sub-committee could find out why a firm chooses to have a different sub-committee. Furthermore, risk management, internal audit, and corporate governance structure are all interrelated. The issue regarding which part of the internal audit, audit committee, and risk management committee is responsible can be examined to clarify their oversight and independence responsibility. Finally, the result of this study shows that the board characteristics and the audit committee characteristics are related to risk oversight, including ERM implementation and the risk management committee structure. As a result, future research could study the link between the boards and the audit committee and how they could separately lead to a different level of ERM implementation.

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