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**Enterprise Risk Management and Firm Performance:
Developing Risk Management Measurement
in Accounting Practice**

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Doctor of Philosophy

The University of Edinburgh

2016

Statement of Originality

This is to certify that the work contained within has been composed by me and is entirely my own work. No part of this thesis has been submitted for any other degree or professional qualification.

To the best of my knowledge and belief this thesis contains no other material previously published by any other person, except where due acknowledgement has been made.

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List of Abbreviations

AAA	The American Accounting Association
ACGA	The Federation of Thai Capital Market Organizations
AEC	ASEAN Economic Community
AIC	Akaike information criterion
AIG	American International Group, Inc.
AICPA	The American Institute of Certified Public Accountants
ASEAN	Association of Southeast Asian Nations
AS/NZS	Standards Australia/ Standards New Zealand
AVE	Average Variance Extracted
BCM	Business Continuity Management
BSC	Balanced Scorecards
CA	Cluster Analysis
CAE	Chief Internal Audit Officer
CAS	Casualty Actuarial Society
CEO	Chief Executive Officer
CFO	Chief Financial Officer
COSO	Committee of Sponsoring Organizations of the Treadway Commission
CRM	Contemporary Risk Management
CRO	Chief Risk Officer
CSA	Control Self-Assessment
C-Suite	Top senior executives
DEFRA	Department of the Environment, Food and Rural Affairs
ECM	Economic Capital Model
ERM	Enterprise Risk Management
FEI	Financial Executives International
FETCO	The Federation of Thai Capital Market Organizations
FX	Foreign Exchange
GDP	Gross Domestic Product
GRC	Governance Risk and Compliance
IIA	The Institute of Internal Auditors
IMA	Institute of Management Accountants
IRGC	International Risk Governance Council
IRM	The Institute of Risk Management
ISO	International Organization for Standardization
IRM	Institute of Risk Management
KPI	Key Performance Indicator
MC	Marginal Cost
MD&A	Management Discussion and Analysis
Moody	Moody's Investors Service, Inc.
MRA	Management Risk Assessment
NAV	Net Asset Value
OGC	The Office of Government Commerce
PCA	Principal Components Analysis
PLS	Partial Least Square Analysis

PRA	Process Risk Assessment
Protiviti	Protiviti Inc.
PWC	PricewaterhouseCoopers, LLP
RM	Risk Management
ROA	Return On Assets
ROE	Return On Equity
SEC	Securities and Exchange Commission
SET	The Stock Exchange of Thailand
SETSMART	SET Market Analysis and Reporting Tool
SOX	Sarbanes-Oxley Act
S&P	Standard & Poor's Financial Services LLC
TRM	Traditional Risk Management
UK	United Kingdom
USA	United States of America
VAR	Value at Risk

Acknowledgements

I would like to express my sincere appreciation to all the people who have supported me throughout my Ph.D.

Firstly, I would like to express my special gratitude and thanks to my advisor Professor Jake Ansell. He has been a tremendous mentor for me. I appreciate his constant help, support and guidance in making my PhD experience both productive and stimulating. Even during the tough times in my PhD pursuit, the joy and enthusiasm he showed was contagious and motivational and helped me to survive this tough journey. I would also like to thank him for the excellent example he has provided as a great professor. He is the perfect role model in my academic career path, and his advice on both my research and my career has been invaluable.

Without the financial support of the Thammasat University, Bangkok, Thailand, which offered me a full scholarship for this study, this work would not have been done. Special thanks also to the Accounting Department of Thammasat Business School for granting me study leave. In addition, I would like to express my heartfelt gratitude to Associate Professor Dr. Monvika Phadoongsitthi, for supporting me throughout my PhD research.

I would also like to thank all the members of the Management Science groups and members of the Credit Research Centre, University of Edinburgh, especially Professor Thomas Archibald, Professor Jonathan Crook and Dr. Galina Andreeva for their suggestions, encouragement and providing me with stimulating opportunities to present my research.

My heartfelt special thanks go to respondents from the listed companies in Thailand for the valuable time and effort they took to complete the survey. This research could not have been completed without their assistance.

Finally, I would like to thank my mom, Mrs. Lai Sithipolvanichgul, my dad, Anan Sithipolvanichgul (MD) and my husband, Assistant Professor Dr. Peter Ractham, for always supporting me. Thank you for listening to me, for encouraging me, for caring and for your unconditional love.

Abstract

The current extremely volatile business world requires firms to deal with a wide range of risks that pose threats to their organisations. The poor practices of risk management, based on Traditional Risk Management (TRM), was cited time and time again in the aftermath of the recent Global Crisis. Enterprise Risk Management (ERM) has been advocated as a solution to the problems of TRM. The aim is to centralise the management of risk within the organisation and ensure that the board deals with the risk. Hence strategic, external, internal, operational, compliance and reputational risk are dealt with jointly. In doing so, it is expected that ERM will bring value creation to firms.

One of the main limitations facing researchers is the lack of a good standardised measurement of ERM implementation; therefore, it has not been possible to establish whether ERM does actually bring benefit to firms. In addition, many companies have set up ERM initiatives, but they lack a clear understanding of the factors that will lead to successful ERM implementation. The remaining unanswered problematic situation has led to two unanswered questions that will determine whether the solution to ERM implementation is avoiding potential pitfalls and improving business sustainability. Firstly, does ERM implementation have an impact on firm performance? And secondly, which is the firm-specific characteristic that leads to better ERM implementation level?

This thesis answers the aforementioned questions by proposing a reliable ERM measurement method, and then testing whether firms that adopt ERM actually improve financial performance and determine the influential factor of ERM implementation. The proposed method for measuring ERM implementation is based on the components developed from the current ERM frameworks, where contribution scoring can be standardised to measure ERM implementation level. To demonstrate its viability, data was collected from publicly listed firms in Thailand and was then compared to three alternative methodologies: cluster analysis (CA), principal component analysis (PCA) and partial least squares (PLS). The results show that the proposed method did well compared to the alternatives, both statistically and in prediction performance.

The relationship between the proposed ERM measurement and firm performance is then considered by taking appropriate control variables into account, such as the firm's size and characteristics, industry effects, sales growth and the external environment: technology, market uncertainty, as well as economic factors. By using data from the Thailand Stock Exchange, it was found that implementing ERM could improve firm performance in term of Tobin's Q, ROE and ROA. The results show that ERM and firm performance are related. For the influential factor of ERM implementation, the empirical results show that a firm's size and economic factors have a statistically positive relationship with a high level of ERM implementation, while lower ERM scores show more revenue volatility than those who have well-implemented ERMs. Furthermore, technology and growth are positively related to each ERM in the scoring system considered.

Chapter One

Introduction

1.1 Introduction

Doing business in the 21st century is more complex, versatile and uncertain than in the past. The challenges and opportunities come together with a wide range of risks that are based on a company's view of risk management (Power, 2013). An example of this is the 2008 financial crisis, which started in the USA and rapidly spread to other Western countries. It led to the failure of some major business, for example Lehman Brothers, and the resulting slowdown caused problem for a number other businesses, like Citigroup, AIG and Washington Mutual. Several economists predicted that the recession that followed the 2008 crisis would be the worst since the Great Depression in the 1930s. After 2008, the effects of the crisis have continued and expanded beyond Western economics into other regions of the world. Furthermore, the European financial debt crisis of 2012 has caused considerable trouble for their trading partners in Asia and Africa. In 2013, Moody's downgraded the UK triple-A credit rating for the first time since the 1970s. The ongoing US economic downturn and the European financial crisis could create economic meltdown chain reactions that the world has not seen for half a century. These financial crises threaten a global crisis that would be the worst that anyone has seen in the last 50 years.

Both risk and uncertainty have had major impacts on most organisations (Protiviti, 2006). Organisations have to observe, manage and control numerous internal and external variables that pertain to risk and uncertainty, as well as their potential outcomes. They are also concerned with their ability to predict and manage both positive and negative outcomes that result from various kinds of risk. Berinato (2004) stated that: "*Balancing risk is becoming the only effective way to manage a corporation in a complex world.*" The effective management of risks can minimise its impact on an organisation and also create numerous opportunities for it to excel in today's dynamic business environment.

This aforementioned phenomenon has led to a large number of organisations finding ways to manage risk and uncertainty. Risk management is a concept that can become a fundamental part of the business (Arena et al., 2010, Mikes, 2008, Power, 2013). Enterprise Risk Management (ERM) is a systematic, integrated approach which attempts to evaluate holistically and manage all of the risks a firm faces, in order to achieve the company's objective (Dickinson, 2001). ERM has become an increasingly popular business strategy in the enterprise (e.g. Hopkin, 2012, Ittner and Oyon, 2014). Firms usually employ it as a tool to evaluate their risk attitude, identify and prioritise their risks, and determine which risks should be accepted, mitigated or avoided. COSO (2004) stated that ERM helps management to align risk appetite and strategy, providing a better response to risk, integrate the view of risk management, enhance cooperate governance, reduce operational surprise and losses, seize opportunities and reduce unacceptable performance variability. The objective of implementing ERM is to provide a reasonable assurance that the company's business objective will be achieved and enhance value creation (Nocco and Stulz, 2006). However, there is still little existing academic research about ERM (Bromiley et al., 2014) and especially the impact of ERM implementation on firm performance (Pagach and Warr, 2010).

Dr. Bonnie Hancock, Executive Director of Enterprise Risk Management, stated in an interview with Steve Dryer, Managing Director and Practice Leader at Standard & Poor's (S&P), on October 2, 2012, that: *"I've been disappointed, so far, frankly, in how difficult it has been to sort of – even the very basic benefits of ERM to be understood and valued by management of companies by – and more importantly, by the owners of those organizations, who you would think would be holding management to a very high standard. And sadly, that's not the case in most cases."*

Many researchers attempted to study the impact of ERM and its relationship with a firm's performance. Most studies used proxies to indicate whether a firm had implemented ERM, such as having a Chief Risk Officer (CRO) appointed or use of an ERM keyword. Most previous researches were studied based on secondary data. It is, therefore, essential to gather information on all ERM components so as to gain insight into ERM implementation. This will then allow the assessment of the impact

of ERM on organisations. This holistic view of ERM requires accurate data on ERM implementation. Secondary data, such as annual report or financial statement, may be not enough to gather ERM components, such as strategy setting, corporate culture, risk awareness, risk appetite, risk framework and risk structure. The best way to gather information about ERM implementation is to ask companies directly for the information.

As the evidence has shown, the lack of reliable measurements to determine ERM performance means that most of the studies fail to solve the problem of assessing the relationship between ERM measurement and the firm's performance (Kraus and Lehner, 2012). Moreover, most prior ERM studies involve companies in the insurance sector. Only few studies are in the non-insurance related market. It is therefore pertinent to conduct the study in the non-insurance related industry as well. The connection between ERM and firm performance has still not been resolved, and there is a need for more research in this area by academics (e.g. Fraser and Schoening-Thiessen, 2010, Mikes and Kaplan, 2013).

1.2 The Driver of Enterprise Risk Management

The concept of ERM and its implications on financial and accounting risks has continued to gain the attention of the business community since the early 2000's (Pooser, 2012). ERM has also become a popular topic amongst researchers since many crises have emerged which affected the long-term value of large corporations. Its importance was further exemplified by the Enron scandal and the enactment of the Sarbanes-Oxley Act of 2002. The act required the board of directors to take on the responsibility to identify and monitor the company's risks. Many countries outside the US have adopted risk and control frameworks, although the term and guidelines might vary from country to country; CoCo in Canada, King Report in South Africa and Turnbull Report in the UK. The Turnbull Report guideline was updated in 2005 following a previous Internal Control: Guidance for Directors on the Combined Code in 1999, in which the requirement for risk disclosure was promoted and incorporated into stock exchange rules. Recently in 2010, the US Securities and Exchange Commission (SEC) has forced publicly traded companies to disclose the role of their board of directors in overseeing risk management in their annual proxy

statements. From the company's perspective, the executives surveyed in the Accenture 2011 Global Risk Management Study revealed that 83 percent of executives perceived the importance of ERM and would expect to spend time and effort to improve their risk management approach in response to the current economic crisis. The crisis has promoted ERM as a top priority to be considered by top managers and directors within companies, as well as others government regulators and stakeholders.

Moreover, credit rating agencies, such as Moody's and Standard & Poor's (S&P), have shown interest in how risks are assessed and managed in the firms. They have looked at whether a firm has implemented the ERM system as a factor in their rating of insurance, banking and even non-financial firms since 2008.

1.3 Research Objective and Questions

ERM may be an effective tool for businesses to achieve their company objectives. The recent global crises made ERM implementation a top priority for most companies. Regulators and financial consultants also support the initiation and implementation of ERM by most companies. Their goal is to help improve the performance of firms by effectively managing their related risks. Furthermore, credit rating agencies employ the ERM system as a factor in their company rating of both financial and non-financial firms. Many firms attempted to develop their ERM system, hoping it would serve as a business protocol that would ensure their survival in an increasingly volatile business world.

The goal of ERM implementation is to help companies to achieve their objectives, which mostly relates to improving the firm's performance. The importance of ERM and the growth of ERM implementation means there is a need for a reliable ERM measurement method to explore whether adopting ERM actually improves the financial performance of firms. The findings of this study will provide empirical evidence and new ways of measuring ERM benefits.

The main objective of this research is to adopt the rigorous holistic perspective of ERM. It aims to investigate the relationship between ERM implementation and the firm's performance.

The overall objective can be divided into five main research sections, which are:

1. To review various ERM definitions and frameworks and to develop an understanding of key features of ERM implementation within listed companies.
2. To develop possible approaches to measuring ERM implementation and evaluate their predictive accuracy.
3. To explore the current stage of ERM implementation in Thailand's listed Companies.
4. To examine whether the implementation of ERM increases financial performance.
5. To examine which characteristics of firms influence their successful ERM implementation.

In summary, this research will adopt the contingency perspective and aims to investigate the relationship between ERM implementation and firm performance by offering new insights that are based on additional empirical evidence. Figure 1.1 presents a summary of the research aims and objectives as follows:

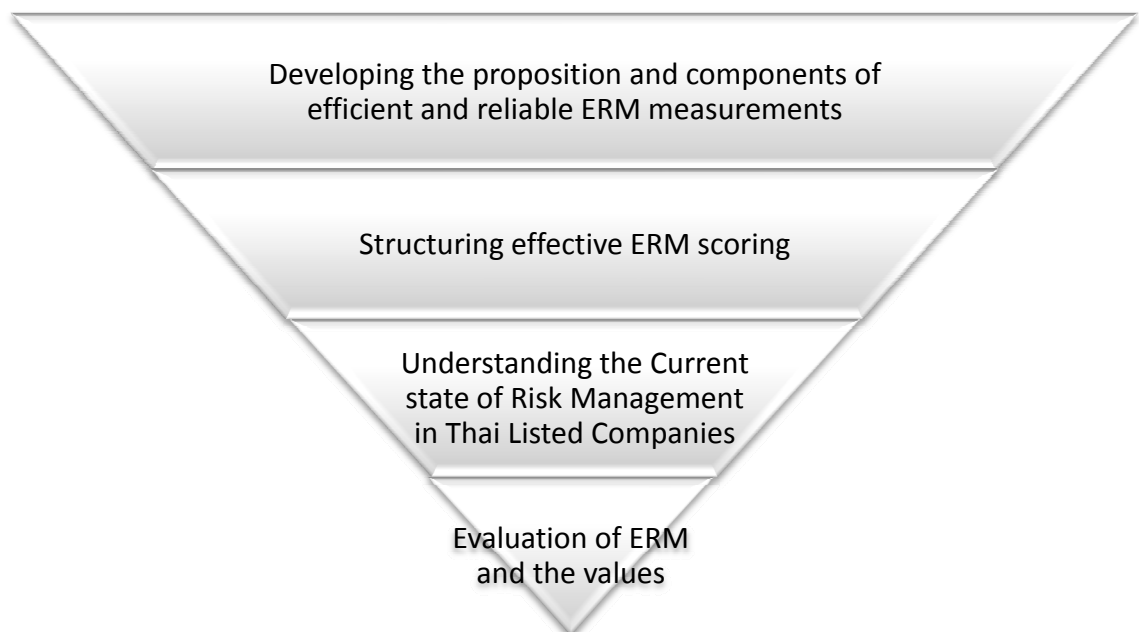


Figure 1.1 Summary of research aims and objective

1.4 Research Method Design Strategy

This study uses exploratory research methodology based on quantitative techniques that has the following research strategies:

1. The early phase of this research contains a literature review of the ERM topic and related information and consists of reviews of various definitions and frameworks of ERM accord in relation to the gathering of ERM contributions for listed companies. The focus is on gathering ERM components to create ERM measurements and a better understanding of the current stage of ERM implementation. By reviewing ERM questionnaires that have been constructed in the academic literature and international standard ERM frameworks, such as COSO ERM framework, ISO 31000, Standard and Poor's ERM rating and other relevance sources of ERM and risk governance field, a survey instrument has been developed. This survey aims to create a measure of the ERM implementation from the respondents who provide a broad, factual picture of the current implementation of risk management, risk governance and enterprise risk management in the Thailand.
2. In order to empirical test the research questions, it is essential to collect an appropriate sample size that allows statistical analysis. The quantitative method is used to achieve a large set of responses. In general, ERM was initially implemented in financial companies and now has spread to non-financial companies. Therefore, the sample size in this study is all of the 518 Thai listed companies in The Stock Exchange of Thailand (SET). The initial analysis provided both the descriptive analysis and statistical analysis, such as the Heckman correction and reliability test, which can be used as evaluation indicators and create reliability, as well as to correct measurement errors.
3. A measure of ERM implementation is proposed which integrates the ERM components recorded in the survey. This measure is then compared to three alternative approaches. These are cluster analysis (CA), principal components analysis (PCA) and partial least square analysis (PLS). The analysis is performed and the judgement is made about both applicability and assessment.

4. The next phase is the collection of relevant data to assess the relationship between ERM implementation and company performance. Control variables are chosen, based on the literature, such as a firm's size and characteristics, effects on industry sales growth and the external environment, such as technological, market and economic variables. The set of control variables are derived from the public datasets of Thai listed companies, namely "SETSMART" and DataStream, which provide information on financial statements, such as balance sheet, income statement and the company profile. Various types of firm performance measurements are considered: Return on Equity, Return on Asset and Tobin's Q.

5. This research also studies the factors that influence the success of ERM within organisations. Based on previous literatures, a set of proposed relationship between ERM implementation and firm-specified characteristic are considered in the ordinal regression model. In doing this, it allows the identification of those factors that have a positive impact on ERM implementation.

Therefore, the overall conceptual model of the research can be presented as Figure 1.2.

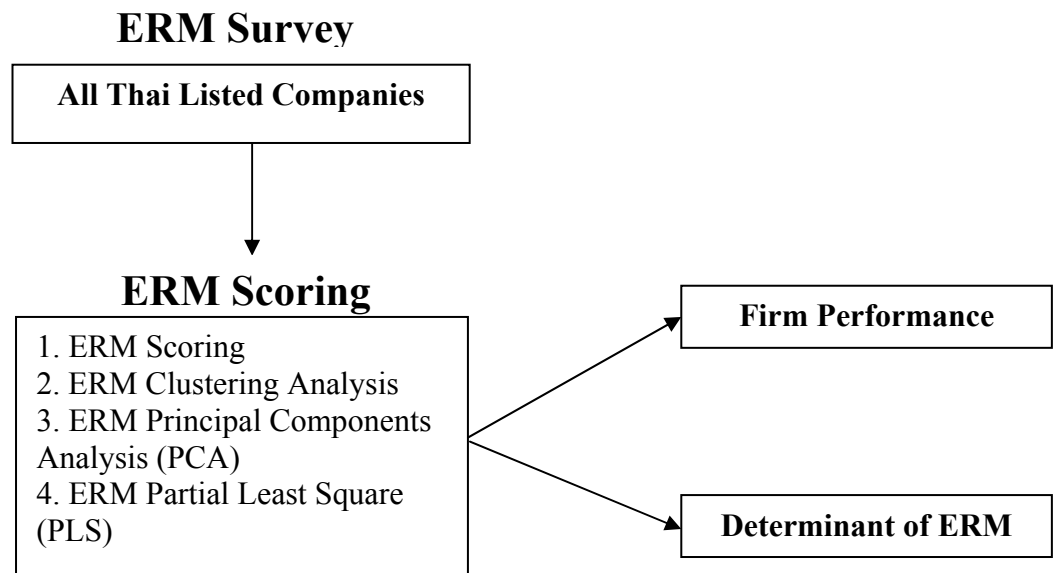


Figure 1.2 Conceptual model

1.5 Structure of Thesis

This thesis, including seven chapters, proceeds as follow. This thesis framework is shown as Figure 1.3. Chapter 1 provides the background and motivation for this study, and both the research objectives and questions are presented. The chapter then describes the research method design strategy and concludes with the contributions of this research.

Following this chapter, Chapter Two presents the overview of risk and risk management. It provides the background and application of risk management practice in this research. This chapter then reviews the various definitions and framework of ERM. A unifying ERM definition and the common components of effective ERM are provided, allowing the development of a new ERM Scoring system, and related research is explored. The relevant literature of the previous method of measuring ERM; the relationship between ERM and financial performance; and the determinant of ERM studies are reviewed. The possible firm-specification factors that led to the effectiveness of the ERM program are explored in this chapter. Overall, this chapter provides the background of risk and risk management, the definition and framework of ERM, the common ERM components and possible factors employed in this thesis.

Chapter Three features the research design and methodology that was used in this study. The research setting begins by providing the rationale behind the choosing sample. The survey methods of gathering ERM measuring components and data collection of other variables are presented in detail. Then, the regression model of ERM and form performance and the regression model of determinant of ERM implementation are described. The data processing involved in the data treatment and data process is also presented.

Chapter Four proposes a method for measuring ERM implementation that is based on the components developed from the current ERM frameworks. The unified ERM components are constructed to explore how to measure the level of ERM implementation. These ERM components form the questionnaire that is used in this

study to demonstrate its viability, and the data was collected from publicly listed firms in Thailand.

Chapter Five presents the results of the survey of ERM in Thai Listed Companies. This chapter shows an initial view of the ERM process and functions in Thailand by outlining the progress and awareness of risk in companies and in ERM implementation. The results of this survey identify both the current state of cooperate risk management at the enterprise level and the next practical step to create effective ERM within enterprises.

Chapter Six proposes an ERM measuring method by integrating well-implemented ERM components where the contribution measuring can be standardised. As a result, the survey data was collected from Thai listed companies in Stock Exchange of Thailand to construct a possible ERM measuring model. Four ERM measurement methods are proposed in this chapter by comparing simple ERM Scoring methods with three different statistical approaches regarding cluster analysis approach, principal components analysis approach and partial least square analysis. Moreover, this is an exploratory study that focuses on providing the better ERM implementation levels by examining how different components enhance the outcome depending on the dimensions, such as the fundamental of risk management structure, evidence of risk management, risk governance, responsibility and accountability, and risk management processes.

Chapter Seven provides and discusses the main results of this study. This study uses linear stepwise regression analysis to explore the relationship between the proposed ERM measurement and firm performance in term of Tobin's Q, ROE and ROA, and the results thus far have been inconclusive. The chapter considers the model by taking into account appropriate control variables. In addition, the result of ERM implementation of non-financial companies is separately analysed to examine the relationship with firm performance. Then, this chapter compares the results of the predictive ERM measurement models. This is based on regression analysis of the basis of the relationship with company performance, taking into accounting control variables. The results of AIC are reported as a criterion instrument for selecting the most appropriate predictive statistical model in the ERM method. This study also

highlights the determinants of ERM implementation, which is critical to the understanding of ERM practice, and the ordinal logistic regression model that is used to examine the determinants of ERM analysis. Finally, the results are presented and discussed.

In conclusion, Chapter Eight summarises the main findings and draws conclusions of this study. The main contributions and implication relating to this research are presented. The limitations of this research are presented and suggestions for future study are provided.

1.6 Contribution of the Research

Regulators, consultants and corporate governance advocates, all suggest that the implementation of ERM can improve firm performance. Executives and boards face pressure to adopt ERM from SEC regulation and other regulators. For example, many companies are currently attempting to implement the ERM system from an international organisation standard or guidelines from consultants (Desender and Lafuente, 2010). With the high pressure to implement ERM, academic researchers, people who manage risk, business owners and financial and non-financial companies are more concerned about whether ERM can create value.

One of the main limitations that faces researchers is the lack of a good measurement of ERM implementation. This thesis provides an approach to ERM measurement that will aid discussion into the effectiveness of ERM. ERM Scoring is developed in this research with the aim of having an effective and reliable ERM assessment criterion. The primary objective is to provide a measure of the level of effective risk management within a company. An ERM score makes it likely that the companies will have a level of effectiveness of risk management. This score indicates the ERM standards and practices of listed companies, and it gives international visibility to the fact that a company is well governed, which might be attractive to investors. The research provides an ERM Scoring method, not only for financial companies, but also for non-financial companies, so that companies can recognise the level of ERM in their business. The results of the research may provide some guidance for all listed

companies at different levels of ERM to develop greater efficiency and more effective risk management.

In addition, the lack of clear empirical evidence proves that the value of ERM could continue to limit the effectiveness of ERM implementation (Hoyt and Liebenberg, 2011). Furthermore, it is costly and takes considerable effort for the highest-level executives to implement a successful ERM implementation within an organisation (Beasley et al., 2008). Therefore, this research is exploratory and provides insights into whether effective ERM implementation improves a firm's performance. It helps practitioners, regulators, consultants and others to understand the importance of ERM better and make a decision about what is the best way to implement risk management in the company, and which components of ERM effect the firm's performance.

Moreover, when many companies have to setup ERM initiatives, they lack an understanding of the factors that will influence the success of these initiatives. This study also highlights the determinants of ERM implementation, which is critical to the understanding of ERM practice. This will be of benefit to practitioners, business advisors and regulators.

Currently, there is no regulation to recognise listed companies that comply with the ERM framework. Risk management guidance in each country exists and regulators obviously advocate the importance of maintaining an effective risk management system. This research provides some exploratory elements of effective risk management and the benefits of ERM by using various frameworks that will help regulators to propose effective risk management guidance. With this in mind, this study embarked on the first survey on risk management practice in Thailand to increase understanding of the state of risk management and provide effective risk management components. The results of this research survey can lead to an increasing expectation being placed on the importance of risk management by regulators, especially in Thailand.

These results, from the ERM survey to testing the ERM measurement method, have contributed to the improvement of good risk management. This is evident by:

1. Listed companies – exploiting it as a benchmarking tool that assists in improving the implementation of risk management and might be used as the KPI of firm performance.
2. Investor/analysts – who gather information about ERM as part of their credit assessment in a similar way to a credit rating agency, such as S&P and Moody's. Investors can incorporate the ERM assessment into their decision making about investments in listed companies.
3. Regulatory Agencies – these indicate the essentials of listed companies' ERM practices and key ERM components, and provide proper guideline or policy where appropriate.
4. Research – the reliable ERM measurement method can contribute to further ERM studies.

Overall, this research demonstrated a reliable ERM measurement of whether the implementation of ERM increases the financial performance or creates value. It can be enhanced by certain contributions from modelling the ERM framework and scoring, thus leading to greater understanding of the benefits of implementing ERM and the determinants of ERM.

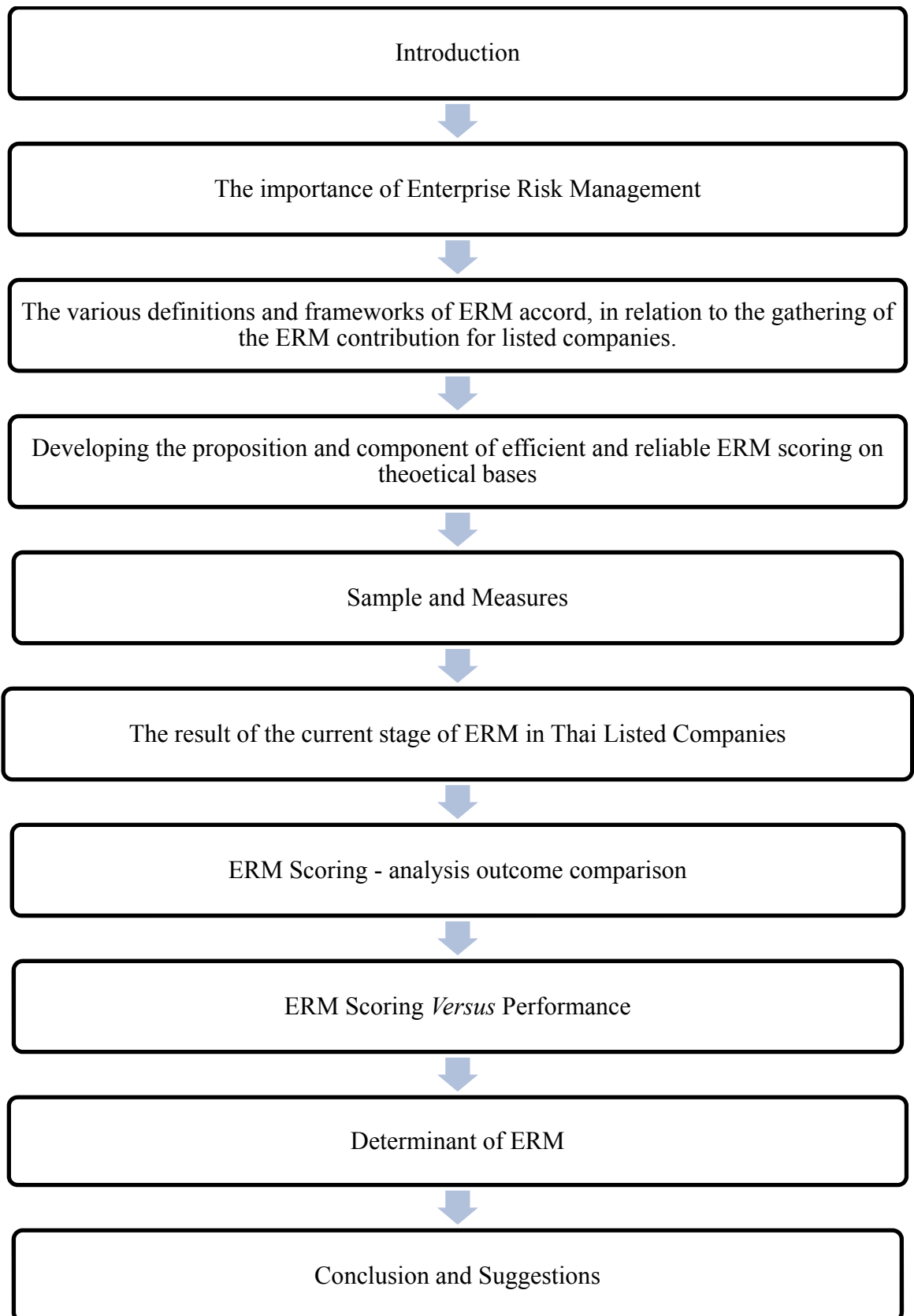


Figure 1.3 Thesis structure

Chapter Two

Literature Review

2.1 Introduction

This chapter lays a foundation for the study by covering risk and risk management. It starts by exploring the term risk and then devotes the latter part of the chapter to investigate the background and application of risk management practice. Risk and uncertainty (Knight, 1921) are everyday aspects of life for both people and organisations. Companies cannot avoid taking risks because it is a part of business activity and is required if they are to survive and drive value creation. They should decide whether a risk is acceptable and if it is not, what the process to deal with the risk is. Organisations also have to be capable of tackling uncertainty and events that are unpredictable need to be dealt with since they can always happen. Both risk and uncertainty can have both good outcomes for business and bad outcomes. Risk management is hardly a new concept; the principles and applications of risk management have been around since possibly the 17th Century in Europe. This chapter attempts to explore these elements with a discussion about the basic concept of risk and uncertainty, as well as risk management, in the first section.

The second part of the chapter covers the definition of ERM and its components by looking at various frameworks and the literature. From the corporate and accounting scandals that have occurred since 2002 to the financial crisis in 2008, it has become increasingly apparent that risk exposures are more dynamic, complex and diverse. Enterprises have faced a wide range of risk in their portfolio of risk. Many businesses fail as a result of both unexpected circumstances and their inability to take into account the interrelationships between different types of risk, such as operation, financial and strategic risk. Stakeholders and regulators have pressured the board of directors of companies to perform more systematically and rigorously when it comes to risk management, and with a greater understanding. The ERM concept proposed in the past decade has received growing interest from practitioners and academics. ERM has been advocated as a solution to the problems of traditional risk management (TRM). It is supposed to overcome the silo-based approach to risk

management of TRM within an organisation by taking a holistic strategic approach. The aim is to centralise the management of risk within the organisation and ensure that the board takes responsibility for managing risk in the organisation. As a result, strategic, external, internal, operational, compliance and reputational risk will be dealt on a joint basis. In doing this, it is expected that there will be advantages for the organisation, as they will gain the ability to merge risk and achieve consistency. The difficulty is that there are many alternative definitions and standards that have been associated with ERM since 2004. Therefore, the definitional problem that is faced when using the term ERM has led to difficulties in its implementation. Various definitions and frameworks of ERM are discussed in this part of the chapter in order to propose a unifying ERM definition and find the common components of effective ERM.

The last part of this chapter considers previous academic research into the field of ERM. The emergence of ERM in practice has influenced the researchers' attention. Although ERM is of increasing interest to practitioners, academic research that presents a better understanding of ERM is still very limited. This problem has been caused by difficulties in measuring ERM for each enterprise. Therefore, this part of the chapter starts with the previous method of measuring of ERM implementation, including previous research into proxy methods, the ERM rating from Standard and Poor's and index methods. Previous research about the relationship between ERM and financial performance are then reviewed. After that, this chapter explores the firm-specification factor that has led to the effectiveness of the ERM program. Finally, there is a conclusion.

2.2 Risk and Risk Management

2.2.1 Definitions of Risk

Risk is a very general term but it has several connotations. Rausand and Høyland (2004) stated that, *"If you ask ten people what they mean by the word risk, you will most likely get ten different answers."* When the Society for Risk Analysis established a committee to define "risk", it suggested in its final report, which took four years of deliberation to put together, that it might be better not to make such a

definition. Kaplan (1997) said that each researcher should define and explain clearly what their risk definition is. It is therefore fundamental in this paper to understand the basis of the definition of risk in order to find the right definition and link this "risk" definition with risk in the context of business.

The Oxford English Dictionary (2013) definition of risk is as follows: *"a situation involving exposure to danger"*, and Webster's Dictionary (2013) also emphasises the negative aspects of risk as the *"possibility of loss or injury or someone or something that creates or suggests a hazard"*. In this context, risk is used to show negative consequences.

The origin of the word risk can be found in the twelfth century and is thought to be from either the Arabic word *risq* or the Latin word *risicum* (Kedar, 1970). *Risq* might appear to relate to *"chance outcomes in general and have neither positive nor negative implication"*. Therefore, taking a risk can also result in a positive outcome. *Risque* has mainly negative connotations but the circumstances can be positive. Therefore, in common English usage, the word risk commonly refers to a negative event.

There are various terms that are related to the word "risk", such as "chance", "possibility", "danger", "gamble", "hazard", "jeopardy", "peril", "speculation" and "uncertainty" (Rudasingwa, 2006). Although these terms for risk and uncertainty are often used interchangeably, they are different. Risk can relate to the uncertain effect that an event might have, which can be either positive or negative. There is a sense of the relative level of the event's probability and is unlike uncertainty, which only considers an event where the probability is unknown (Pritchard, 2010). Liu (2011) mentioned that Knight (1921) had given the first modern definition of risk and uncertainty, which is generally defined as *"the probability of something undesirable happening"*. Risk derives from uncertainty (Blackwell and Girshick, 1954, Boritz, 1990). Blackwell and Girshick (1954) define risk as a function of the combination of the loss function, which stems from uncertainty, and the decision function. Boritz (1990) defines risk as uncertainty in the same way. Risk is defined as *"the possibility of loss as a result of a combination of uncertainty and exposure flowing from*

investment decisions or commitments". It can be mentioned that risk is a combination of uncertainty, possibility and chance that will happen in the future and can have both a positive and negative impact. It can therefore be said that risk is everywhere, not only for businesses, but also for everyone else who experiences uncertainty about a future event that might result in an unexpected or adverse outcome. This can be called "risk". Ansell and Wharton (1992) concluded that the common usage of the meaning of risk has changed overtime *"from one of simply describing any unintended or unexpected outcome, good or bad, of a decision or course of action to one which related to undesirable outcome and the change of their occurrence"*. Therefore, risk can range from a positive to a negative event and it might be appropriate to apply the risk definition of Ansell and Wharton (1992) in this research, who said: *"A risk is any unintended outcome of a decision or course of action."*

Many authors have provided a definition of risk. Risk, in an organisational context is traditionally defined as anything that can have an impact on the achievement of the company's objective, or as a negative event that could disrupt performance. The concept of ERM involves both negative and positive sides, such as losses and the possibility of increasing value for stakeholders. Hopkin (2012) summarised the definition of risk in the business context, as shown in Table 2.1:

Table 2.1 Definitions of risk, as used in the business context

Organisation	Definition of Risk
Ward (2000)	The cumulative effect of the probability of uncertain occurrences that may have a positive or negative effect on a project's objectives.
ISO 31000 (2009)	The effect of uncertainty on an objective. Note that the effect may be positive, negative or a deviation from the expected outcome. Risk is also often described by the event, a change in circumstances or a consequence.
IRM (2002)	Risk is a combination of the probability of an event and its consequences, which can range from positive to negative.
HM Treasury (2004)	Uncertainty of an outcome, within a range of exposure. This arises from a combination of the impact and the probability of potential events.

(Adapted from Paul Hopkin, 2012)

Alternative definitions are provided to show that there is a wide range to the nature of risk that can affect an organisation. The international guide to the risk-related definition is ISO 31000. This defines risk as the “effect of uncertainty on objectives”. Hopkin (2012) pointed out that this definition requires a level of knowledge about risk management used in the organisation. Whereas the Institute of Risk Management (IRM) says, *“Risk is the combination of the probability of an event and its consequence. Consequences can range from positive to negative”* (Hopkin, 2012). This is a practical definition that can be easily applied. The Institute of Internal Auditors indicates that risk is measured in terms of its consequences and the likelihood of these happening. Many organisations define the term of risk in very different ways. Over time, a number of different terms have been created that make the meaning of risk more complex.

Hopkin (2012) provided a comprehensive definition of the word risk in the business context, concluding that a major risk to an organisation is: *“An event with the ability to impact (inhibit, enhance or cause doubt about) the mission, strategy, project, routine operation, objective, core process, key dependencies and/or the delivery of stakeholder expectations”* (Hopkin, 2012). This definition is likely to bring the word risk into the organisation in a practical way. Hampton (2009) definition of enterprise risk is related to Hopkin's risk definition. This definition is the possibility that actual results will not be related to the expected outcome, and that risk has two main characteristics, which are:

1. Variability: the expected outcome from a business operation or objective may not match with the forecast, plan, timeframe or budget that was expected.
2. Upside risk: the outcome of the events is better than expected and so can be called an opportunity.

In other words, enterprise risk or company risk involves any risk or uncertainty that comprises of both negative and positive outcomes. While looking at the downside of possibility, it is essential to minimise the possibility of operational surprise and losses by preventing and detecting this while carrying out business operational tasks. On the positive side, it is possible to seize opportunities as well as detect threats and

to increase the likelihood of the business achieving their objective and increasing their value.

2.2.2 Risk Management Definition

Risk management has a different definition (Hopkin, 2012), which is based on both its origin and practice. The practice of risk management began in ancient times, in the earliest period of human existence, and during everyday life our human nature exploits our experiences and uses our instinct to survive. In 1998, a letter from Douglas Barlow, a risk manager of Canada's Massey Ferguson Company, to the author gave genetic expression to this, which reiterates this sentiment that risk management is innate (Kloman, 2010). *Homo sapiens* survived by developing "*an expression of an instinctive and constant drive for defence of an organism against the risk that are part of the uncertainty of existence*" (Kloman, 2010). A few philosophers in ancient times, such as Homer, Odysseus, Thucydides, etc, tried to resolve uncertainty by emphasising conservation, deduction and prediction, which demonstrated the process of risk management. After examining the Renaissance and Enlightenment eras, Bernstein (1996) described in 'Against the Gods' the theory that "*the idea of risk management emerges only when people believe they are to some degree a free agent,*" and developed the concept of risk and opportunity. People are thus able to use both experience and data to calculate the probabilities and so predict what should happen in the future.

Looking at the business context, it is clear that insurance may be regarded as the origin of risk management. An organisation can manage risk by reducing possible hazards through insurance. An early key development in risk management emerged during the 1950s as a result of the insurance management function in the US, and then the concept of contingency planning emerged in the 1960s, which has become more essential to businesses. Owing to the high cost of insurance and the fact it was insufficient to protect businesses, risk management became a more popular method to safeguard a firm's assets and control its business operation. In Western Europe and the US, the concept of risk management placed emphasis on the cost-benefit issue during the 1970s. This expanded the concept of the total cost of risk, or risk

financing and control, which fuelled a major development in risk management during the 1980s. The application of risk management procedures developed considerably due to enterprises, financial institutions and also project management. In the 1980s, financial departments initially established a financial risk management approach by integrating risk and a financial perspective together. From the 1980s to the 1990s, risk management tools and techniques combined to deal with market risk, credit risk and operational risk for financial institutions. As businesses faced many uncertainties that were not insurable, there was a need to protect shareholder value. During the period, risk management was defined as “*the method of approaching a problem of how to deal with pure threats which threaten an organization...*” (Pritchard, 1978). Afterwards, the risk management characteristics for risk management practitioners changed from insurance, or the security function (Vaughan and Vaughan, 2002), to protecting business. Risk management developed to consider risk as having both positive and negative outcomes (Ward and Chapman, 2003). Insurance has now become one of the options that can be used to manage hazards and risks.

There was a refocusing of risk management during the early 1990s (e.g. Power, 2004, Power, 2007, Spira and Page, 2003). Subsequently it was referred to as TRM, when the types of risk expanded to cover the external environment, including: competitors, legal, medical, markets; business strategies and policies: capital allocation, product portfolio, policies, business process execution: planning, technology, resources; people: leadership, skills, accountability, fraud; analysis and reporting: performance, budgeting, accounting, disclosure and technology and data (Stroh, 2005). The principle has now moved away from its origins of trying to transfer risk to third parties, to the better management of risks and opportunities by minimising the level of risk itself (Hopkin, 2012). Risk management is not only about avoiding negative outcomes, since risk can involve both positive and negative indeterminacy. However, risk management was still characteristically regarded as the management of risk on a “silo” basis, with each department managing risk through their own responsibility with each type of risk, such as external, internal, operational, compliance and reputational risk, independently managed and conducted in a narrow and limited fashion, through fragmented activities.

During the mid-1990s to 2000s, the concept of ERM developed from a focus on managerial and corporate governance. The new position of Chief Risk Officer (CRO) was created during this period. Businesses were encouraged to develop this risk management system by financial scandals, such as Enron and WorldCom, and its rapid growth was due to the Sarbanes-Oxley Act of 2002 in the US. ERM has been advocated as a solution to the problems of TRM. Corporate governance advocates that the concepts underlying ERM aid the appropriate handling of risk within an organisation. Many ERM frameworks developed during that time gave the components of effective risk management, and ERM was taken up by banks, insurance companies and energy companies. For example in 2004, a Tillinghast-Towers Perrin survey reported that around 40 percent of the insurance industry used ERM implementation and had a CRO position. The 2008 financial crisis created more fuel to the question of TRM and led to both financial and non-financial companies taking a holistic, strategic and process-oriented approach to ERM that would handle both the external and internal risks that an organisation might face, with the intention of enhancing shareholder value.

Current definitions of risk management are various and depend on the organisation providing the definitions. See Table 2.2 for some potential definitions. Hence, risk management is a way of dealing with a range of uncertainty about the outcomes of situations that affect value creation. From the past to the present, risk management has had the same objective. It aims to both manage and control uncertainty in order to ensure that the operational process continues and deals with the possible risk impact on corporate achievement. All of these terms can be called “Risk Management”. Whatever it is called, the substance is more critical than its title. The different procedures and components of risk management can lead to the development of different names for risk management from time to time. For example, "Risk Management" (RM) and "Contemporary Risk Management" (CRM) are known as “Traditional Risk Management (TRM)”. The concept under study is “Enterprise Risk Management” (ERM) and hence part of “Governance Risk and Compliance” (GRC). Some academics and practitioners claim that ERM and GRC are interchangeable (e.g. Mashal, 2013, Racz et al., 2010), whilst other groups claim

that GRC is a newer concept that is driven by governance and compliance, and ERM is a part of GRC (e.g. Banham, 2007, Dafikpaku, 2011).

Table 2.2 Definition of risk management

Organisation	Definition of Risk Management
IRM (2014)	Process which aims to help the organisation understand, evaluate and take action on all of their risks, with a view to increasing the probability of success and reducing the likelihood of failure.
ISO 31000 (2009)	Coordinated activities to direct and control an organisation with regard to risk.
Hopkin (2012)	The set of activities within an organisation that is undertaken to deliver the most favourable outcome and reduce the volatility or variability of that outcome.
HM Treasury (2004)	All the processes involved in identifying, assessing and judging risks, assigning ownership, taking actions to mitigating or anticipating them, as well as monitoring and reviewing the process.
Caver (1985)	The method of managing that concentrates on identifying and controlling the areas or events that have a potential to cause unwanted change... it is no more and no less than informed.

(Adapted from Paul Hopkin, 2012)

2.3 Difference between ERM and TRM

The main characteristics of ERM are different from the characteristics of TRM because the ERM approach is integrative and holistic, by unifying all of the different types of risks and integrating them into the organisation's overall objectives (Rodriguez and Edwards, 2009). In contrast, a TRM approach usually uses a silo-based approach. Silos occur when organisations view each type of risk as a stand-alone object and so act on each risk independently from the other types of risk they face (Pagach and Warr, 2010).

Hence, ERM proposes a paradigm shift in risk management that allows companies to evaluate their risk attitude, identify and prioritise risks, and determine which risks should be accepted, mitigated or avoided in an integrative and holistic review process. ERM also focuses on developing an appropriate risk management strategy and adopting an enterprise-wide risk management process, with support from employees across all levels of the company who can help to achieve the company's

objectives (Rodriguez and Edwards, 2009, Gordon et al., 2009). The differences between TRM and ERM, adapted from Banham (2004), are shown in Table 2.3.

Table 2.3 Differences between TRM and ERM

Traditional Risk Management	Enterprise Risk Management
A "Silo" approach	An "Holistic" approach
Risk as individual hazards	Risk viewed in the context of business strategy
Risk identification and assessment	Risk portfolio development
Focus on discrete risks	Focus on critical risks
Risk mitigation	Risk optimisation
Risk limits	Risk strategy

(Adapted from Banham, 2004)

2.4 ERM Definitions and Frameworks

A more structured ERM framework has been adopted by a number of companies to suit their organisation and enhance their short and long-term shareholders' values (Beasley et al., 2008, Hoyt and Liebenberg, 2011). The designs and implementations of the company's ERM framework are usually based on the experiences and knowledge gained from their past internal control processes (Tonello, 2007). The difficulty of ERM implementation is that there are many alternative definitions and standards associated with ERM practice. There is also still a lack of consensus regarding mutual terminology (e.g. Aven, 2012, Henriksen and Uhlenfeldt, 2006, Raz and Hillson, 2005). Hence, ERM has become very idiosyncratic in implementation.

The existence of a range of ERM definitions and frameworks arises from the principles and guidelines about implementation that have been issued by international organisations, such as COSO ERM framework (COSO, 2004), Casualty Actuarial Society framework (CAS, 2003) and International Standard for Risk Management (ISO 31000, 2009). Moreover, consultancies and professional organisations have also constructed their own ERM frameworks and made recommendations throughout the business as a comprehensive approach to managing risk. Each ERM framework has attempted to create effective risk management and bring clarity to the field; however, no standard has emerged that can establish

uniformity as a global ‘best’ practice. Instead, they have introduced new problems and more confusion (Aven, 2012). There might be a need for more focus on foundation issues and a way to harmonise both risk management practice and definitions of risk (Liuksiala, 2013).

Mikes and Kaplan (2013) has indicated that the current ERM research paradigm is based upon an inaccurate and insufficient concept of ERM. Research into ERM has shown signs of maturity, but there are still only a few significant and productive results.

Each ERM framework should have some linkages and connections that will lead to a better understanding, as well as harmonise risk management practices, by establishing common practice. The subsequent section will review and discuss the foundation of several ERM definitions and frameworks.

2.4.1 International ERM Standard: Definition and Framework

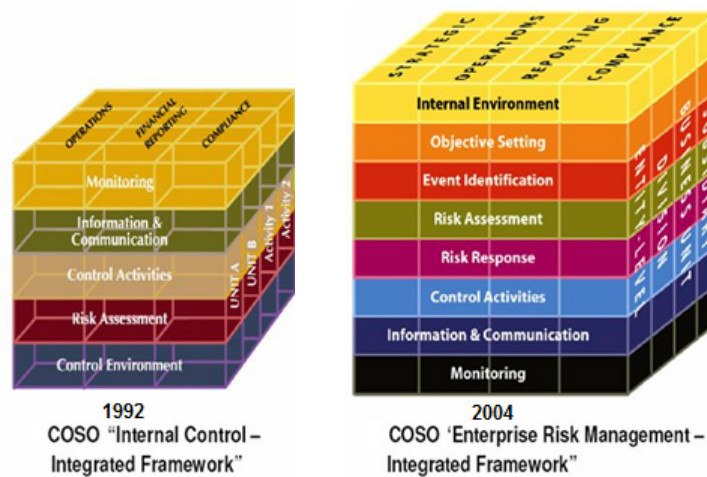
In the following sections, the researcher will examine each of the existing ERM frameworks: 1) COSO ERM framework, 2) ISO31000 3) Casualty Actuarial Society (CAS) and 4) Standard & Poor's Enterprise Risk Management: Analysis into Corporate Credit.

2.4.1.1 COSO ERM Frameworks

COSO ERM (2004) framework is the most widely accepted ERM framework (shown in Figure 2.1). As there are inconsistent definitions of the concept of risk management across various industries, COSO attempted to develop a consistent risk management definition by signing a contract with the public accounting firm Price Waterhouse Cooper (PWC) and proposing an ERM framework. The COSO ERM framework is the most popular definition of ERM that is used in accounting literature (Beasley et al., 2005). It started in the US after the corporate fraud-related failure of the US Corporation Enron led to the passage of the Sarbanes-Oxley Act (SOX) of 2002. Specifically, SOX Section 404 required US listed companies to use a control framework in their internal control assessments that provides specific requirements, which correlate with COSO's internal control framework concept in order to

implement both appropriate internal control and financial reporting transparency. When COSO's internal control developed into COSO ERM, this new framework became the primary framework used by US enterprises and became accepted worldwide (Gordon et al., 2009, Fraser and Schoening-Thiessen, 2010, Berinato, 2004, Power, 2009). Power (2007) states that the COSO ERM framework is "*a world-level template for best practice*". The COSO ERM differs from previous COSO internal control frameworks (COSO, 1994) because it applies a comprehensive view of the enterprise that includes strategic issues and a deeper methodology of risk assessment (Cendrowski and Mair, 2009).

Figure 2.1 shows the comparison components of the COSO framework. Both frameworks use a three-dimensional model as a matrix in the form of a cube with a front (1st horizontal rows dimension), top (2nd slices) and side (3rd vertical columns). The 1st horizontal rows represent the risk management process components, the 2nd slices represent the entity's objectives and the 3rd vertical columns are the organisational units of the entity. The first dimension is the horizontal rows. The COSO internal control (1992) framework has five components, including control environment, risk assessment, control activities, information and communication and monitoring. The COSO ERM (2004) framework expanded the risk assessment component from the previous framework by adding three new components, which are objective setting, event identification and risk response for effective risk management. Therefore, COSO ERM (2004) has eight components, including internal environment, objective setting, event identification, risk assessment, risk response, control activity, information, and communication and monitoring. The second dimension is slices. COSO internal control (1992) has three entity objectives, including operations, financial reporting and compliance. The COSO ERM (2004) framework added a strategic objective into the new framework. Consequently, COSO ERM (2004) is determined to be effective in four categories of objectives, including strategic, operations, reporting and compliance, respectively. The third dimension is vertical columns. The control of COSO internal control (1992) exists within a designated function or activity; meanwhile, COSO ERM (2004) is applied to multiple levels of the enterprise, from entity level to individual division, business unit and subsidiary.



(Colour differentiate horizontal)

Figure 2.1 Comparison of the COSO ERM framework

COSO defined Enterprise Risk Management as:

"A process, effected by an entity's board of directors, management and other personnel, applied in strategy setting and across the enterprise, designed to identify potential events that may affect the entity, and manage risks to be within its risk appetite, to provide reasonable assurance regarding the achievement of entity objectives."

COSO's ERM is thus presented as a comprehensive and holistic way for an enterprise to manage risk across the entire organisation to achieve their objectives (Mikes, 2009, Pagach and Warr, 2010).

However, Fraser and Schoening-Thiessen (2010) found that COSO's ERM manual, which was initially published in the framework by COSO, was not being considered as a key source of information and guidance for implementing ERM in the firm, as it was a general framework and difficult to both understand and implement. They suggested that if the company wanted to follow the COSO framework, it might be better to follow the 'Guide to Enterprise Risk Management: Frequently Asked Questions' by Protiviti (2006) because it was more understandable. Gjerdrum et al. (2011) have stated that: *"The COSO ERM Framework is a complex, multi-layered and complicated directive that many organizations have found difficult to implement."*

2.4.1.2 ISO 31000: the International Risk Management Standard

ISO 31000 was published in 2009 (ISO31000, 2009) as the Principles and Guidelines on Implementation by the International Organization for Standardization, which was revised from the Australia/New Zealand risk management standard (AS/NZS 4360). Its framework gained popularity in Australia, but it has not been widely adopted in the US or UK (Everett, 2011). The main principle of this standard aims to provide generic guidelines on effective risk management by using the concept of risk governance and a centralised concept to the process of managing risk in order to accomplish the strategic objectives of the firm as an effect of the uncertainty approach. The risk management process established a detailed context by supporting a coordinated view of risk and consultation that could be applied to the entire level. ISO 31000 uses the general term of “risk management” in its standard. It defines risk management as

“coordinated activities to direct and control an organization with regard to risk” and defines the risk management framework as a “set of components that provide the foundations and organizational arrangements for designing, implementing, monitor, reviewing and continually improving risk management throughout the organization”.

The strength of the ISO 31000 risk management approach is its identification of the risk owner, which is essential for accountability, communication and the importance of risk management training throughout the organisation. This framework provides a concept where risk management is centralised and linked to the business objectives of all levels of the organisation by planning, management and governance (Gjerdrum et al., 2011). The authors also recommends that internal audit or risk managers, who have already fully implemented COSO ERM and are considering changing to ISO 31000, do not necessarily have to switch completely. There is a high degree of commonality between the two approaches.

Some also claim that the purpose of ISO 31000 is to provide the principles and generic guidelines on risk management for any public, private, enterprise, association, group or individual. The standards and guidelines introduced apply to all firms and they also try to manage all types of risk. This means they are too general and lack specific meaning, so it might not be a good guideline or step-by-step method to implement ERM (Mikes and Kaplan, 2013). Leitch (2010) stated that:

“Many of the definitions in ISO 31000 are not clear and meaningful, let alone close to the actual usage of the terms.” For example, ISO 31000 defines risk as the effect of uncertainty on objectives. This definition leads to different interpretations of the exact meaning of risk. ISO 31000 is unclear and leads to an illogical decision if followed. It is impossible to comply with and does not have a mathematical basis, as it has little to say about probability, data and models (Aven, 2012).

2.4.1.3 Casualty Actuarial Society Framework

In 2003, the Casualty Actuarial Society (CAS) had an ERM committee and summarised the ERM process. It was based on the Australia/New Zealand risk management standard (AS/NZS 4360), which was an early version of ISO 31000. The main objective of risk management is similar to COSO ERM and the ISO 31000 framework in that it focuses on value creating and achieving the firm’s objectives.

CAS (2003) defines ERM as:

“The discipline by which an organization in any industry assesses, controls, exploits, finances, and monitors risks from all sources for the purpose of increasing the organization's short- and long-term value to its stakeholders.”

The CAS recommends establishing an independent risk management structure for implementing ERM, e.g. the CRO, the CRO's staff and the risk management committee. These approaches also provide the ERM synonym with “strategic risk management”, “integrated risk management” and “holistic risk management”. These all highlight a comprehensive view of risk management that changed from the “silo” approach of managing different risk within an organisation to a holistic approach. Therefore, many researchers use these synonyms as keywords to identify ERM.

2.4.1.4 Standard & Poor's and Enterprise Risk Management

Standard & Poor's (S&P) have included an ERM component in their credit rating analysis of companies since 2005, which is based clearly on ERM in the energy, financial services and insurance sectors (Desender and Lafuente, 2009). With the risk and uncertainty still continuously a concern for business enterprises, S&P introduced an ERM rating approach in 2008 for non-financial companies as part of their corporate credit rating analysis. Therefore, to achieve a good S&P rating both financial companies and non-financial companies should focus on risk management culture and strategic risk management. With a high credit rating score, companies can lower their borrowing costs and benefit by making their stakeholders more confident. S&P did not create a new definition but instead created four major analytic components as part of ERM. These components included: analysis of risk controls, analysis of risk management culture and governance, analysis of emerging risk preparation and analysis of strategic risk management.

S&P's ERM classifications give precedence to the real value of ERM by creating a culture of risk resilience, which is demonstrated in the firm's strategic risk management. S&P's is concerned about the variability of a company's management oversight, strategic linkage, resilience and their ability to adapt to changing conditions that have an influence on their credit rating (S&P, 2008). The problem with the S&P's ERM rating is that, while assessing the effectiveness of ERM, it is subject to judgement (Hampton, 2009). S&P does not indicate any ERM framework and how to implement ERM to achieve good practice, it just mentions the components of effective risk management when scoring a company's risk management process. S&P does not require companies to comply with any particular standard, only to provide adequate evidence of effective risk management.

Therefore, most of the companies still use COSO ERM or ISO 31000 frameworks to follow and implement ERM, but it is essential to consider the indicators of effective risk management by S&P in order to strengthen the ERM process.

In summary, the various definitions of ERM taken from the International Standard Organization and academic circles are summarised in Table 2.4.

Table 2.4 Definitions of ERM from International Standard Organization

Definition by	ERM Definition	Reference by previous literatures
COSO (2004)	<p>“A process, effected by an entity's board of directors, management and other personnel, applied in strategy setting and across the enterprise, designed to identify potential events that may affect the entity, and manage risks to be within its risk appetite, to provide reasonable assurance regarding the achievement of entity objectives.”</p> <p><u>Scope of Risk</u>: 1. Strategic risk 2. Operational risk 3. Reporting risk 4. Compliance risk</p>	<p>Beasley et al. (2008) Arnold et al. (2011) Gordon et al. (2009) Tahir and Razali (2011) Pagach and Warr (2010) Desender and Lafuente (2010)</p>
ISO (2009)	<p>“It is not a stand-alone activity that is separate from the main activities and processes of the organization. Risk management is part of the responsibilities of management and an integral part of all organizational processes, including strategic planning and all project and change management processes.”</p> <p><u>Scope of Risk</u>: Mention all risk types, especially those separated into: 1. Financial risk 2. Infrastructure risk 3. Marketplace risk 4. Reputational Risk</p>	<p>Purdy (2010) Aven (2011) Lalonde and Boiral (2012)</p>
CAS (2003)	<p>"The discipline by which an organization in any industry assesses, controls, exploits, finances, and monitors risks from all sources for the purpose of increasing the organization's short- and long-term value to its stakeholders."</p> <p><u>Scope of Risk</u>: 1. Hazard risk 2. Operational risk 3. Financial risk 4. Strategic risk</p>	<p>Seik et al. (2011) Acharyya (2009) Gordon et al. (2009)</p>
S&P ERM rating	<p>“... is tailored to each insurer's risk profile and focuses on five main areas: risk management culture, risk controls, emerging risk management, risk models, and strategic risk management.”</p> <p><u>Scope of Risk</u>: All key risks in the risk register</p>	<p>McShane et al. (2011) Baxter et al. (2013)</p>

2.4.2 ERM's Definitional Dilemma

There are no universally accepted definitions of ERM that have been agreed upon by both international organisations and academics. Kraus and Lehner (2012) has investigated various definitions from 25 studies and found that 13 of them adopted the ERM framework as a definition and 11 created their own definition from their diverse literature reviews. This inconsistency and lack of uniformity in ERM frameworks has created confusion amongst practitioners and researchers (Mikes and Kaplan, 2013, Nielson et al., 2005). Power (2007) indicated that COSO's ERM framework is the one that is generally accepted in studies of ERM. Hence, the COSO ERM definition is used in many ERM studies (e.g. Beasley et al., 2008, Arnold et al., 2011, Gordon et al., 2009, Tahir and Razali, 2011, Pagach and Warr, 2010, Desender and Lafuente, 2010). Whilst the S&P's ERM component is more commonly used in some research areas, mainly in the area of insurance companies (e.g. McShane et al., 2011, Baxter et al., 2013). The ERM framework from CAS is only used in two studies (e.g. Seik et al., 2011, Acharyya, 2009).

2.4.3 The Holistic ERM Definition

An ERM definition can be proposed as a basis for this research. This definition is based on essential elements from the International Organization standardization ERM's framework by COSO, ISO 31000, CAS and Standard and Poor's ERM rating, and is a new ERM definition. Hence, my definition would be:

ERM is defined as an integrated framework or a process of managing the interdependencies between the company-wide risk; by which the companies need to create well-organised risk governance and culture, identify, measure, manage and disclose all key risks by receiving support from employees across all levels of a firm thorough effective information, communication and staff training to increase business performance, the organisation's effectiveness and increase value to stakeholders.

2.5 Components of an Effective ERM Implementation Leading to the Best Practice

This section summarises previous features of ERM from past works that led to effective ERM implementation. The broad concepts and main features from various holistic risk management frameworks on enterprise-wide biases could be formed as ERM components in this section to formulate a comprehensive best practice in ERM.

2.5.1 Fundamentals of ERM through an Integrated Risk Governance

Risk governance is rapidly becoming more important and relevant worldwide and is necessary if there is to be effective risk management (Chapman, 2011). The goal of risk governance is not to lower risk. Instead, the focus is on managing risks more efficiently on an enterprise-wide basis, so as to enhance stakeholder value ((Branson, 2010). Mandal and Chris (2011) stated that, “*without effective risk governance, you can forget about effective risk management*”. Risk governance involves the main belief of the governance concept and is undertaken by integrating the risk management context and risk decision making (Cunningham et al., 1998). The concepts of risk governance comprise of a board scope of risk that extends beyond traditional elements of risk analysis, risk communication and risk management. It integrates the structure, role and capacity of the organisation, stakeholder involvement, collaborative decision making, accountability and responsibility (Renn, 2008) by carefully considering the legal, institution, social and economic contexts while the risk management process is being established (Renn and Walker, 2008). While the International Risk Governance Council (IRGC, 2007) points out that risk governance is related to a wide range of risk owner involvement, requiring co-ordination between roles and responsibilities, guiding principle, value system, perceptions, perspective, achievement, as well as organisational imperative. In the business context, Protiviti (2009) defined governance as an

"oversight that includes objective and strategy setting, delegation of authority, and monitoring and evaluation. It is the process by which directors and executive management set overall business objectives and oversee progress toward those objectives".

Segal (2011) stated that the ERM framework provides a functional structure, which is the fundamental infrastructure of the ERM process. Risk governance is also the most important component that drives the ERM program in the organisation. Risk governance provides the hierarchical structure of ERM, including three components, which are: 1) the role, responsibility and accountability, 2) organisational structure, and 3) policies and procedures that govern the ERM program. Increasingly, the promotion and improvement of risk governance stems from the problem of corporate governance breaches, business failure and financial fraud, with increasing compliance, as well as regulation, on oversight by the board (Mikes, 2009). The development of governance and the organisational structure has given risk more importance at board level and it is fundamental to the effective implementation of ERM (Tonello, 2007, Liebenberg and Hoyt, 2003).

2.5.2 A Holistic Perceptive of ERM

The main component of ERM, which is significantly different from TRM, is the holistic view of risk (Rodriguez and Edwards, 2009). There has been a fundamental change in the concept of risk management and in the way that organisations deal with risk (Power, 2013). ERM has noticeably become the risk management framework within most organisations (Hopkin, 2012) through its integrative approach within the planning, strategic setting and performance measurement process. The concept of ERM cannot be readily quantified or aggregated. Therefore, the focus of a holistic risk management approach is on the inclusion of non-quantifiable risk into the risk management framework, as long as the top management consider a strategic view of risks (Mikes, 2009).

The fundamental idea of ERM is to move from the separate management of a single risk to a unifying and more integrated approach to managing overall risk (Hoyt and Liebenberg, 2011, Moeller, 2007). Therefore, an enterprise manages all the risks that it faces across the organisation by considering the processes, objectives and the impact of people on the company's objective, which in turn values the creation of an enterprise. Many risks are interrelated across the operations, and so a silo-bases perspective (Gordon et al., 2009) – where different owners within an enterprise

separately manage individual risks – can develop so that the TRM approach can fail to address the connection between risks. The ERM approach started by considering the accomplishment of the organisation's objectives, core dependencies and key strategic objectives. It considered the overall risks that were perceived as threats and evaluated them so that if more than two risks have an impact on the same objective they will be evaluated and managed jointly under an acceptable level of risk taking.

However, many researchers (Hampton, 2009, Olson et al., 2008, Fraser and Simkins, 2010) point out the problem of adopting a holistic view of risk when all the risks are supervised in a centralised way. Risk owners might ignore significant risks that they consider to be outside their own operation or business unit. Therefore, if they are to motivate employees, it is essential for an enterprise to have risk awareness, be accountable and take more proactive action to manage risk in a holistic way that will impact on their daily operation (Barton et al., 2002). In particular, ERM implementation requires all employers that manage risk outside the scope of their own work to take more responsibility and improve coordination than they do with TRM (Olson et al., 2008, Pickett, 2005). For an effective ERM implementation, an enterprise should adopt a holistic view of risk management by simultaneously establishing a risk culture (Lam, 2014), enhancing the company's risk management philosophy (Liu, 2011) and aligning identified business risks into their routine corporate and business unit process (COSO, 2004, Protiviti, 2006, Moeller, 2007). This would take into account how employees perceive both their accountability and responsibility for risk management (Deloitte, 2009, AON, 2010, Chapman, 2011, Cendrowski and Mair, 2009), how the coordination of work is promoted amongst risk owners (Liu, 2011) and on-going communication is developed with relevant stakeholders (Chapman, 2011).

2.5.3 ERM: A Critical Tool for Strategic Risk Management

The ultimate goal of ERM (COSO, 2004) is to apply strategies that have been set across the company to achieve its objective. In TRM, or the silo-based approach, risk management is often decentralised or done in isolation by each business unit leader in the organisation. TRM can impede the gathering of various risk aspects, particularly strategic risks, because there is minimal communication. When the overall risks are not incorporated and strategic risk management is overlooked, it can lead to dangerous "blind spots" in the strategic management process. The ERM approach differs from a TRM approach. When ERM is incorporated in order to centralise the management of risk within the organisation, it might be linked to better risk association and lead to the development of a complete risk strategy. ERM has the objective of balancing enterprise risks under the company's risk appetite in order to enhance the benefits for stakeholders. Therefore, embedding ERM into the organisation should enhance the likelihood of more effective links between strategic risk management and the strategic management process, not only to prevent and protect the company by safeguarding its assets, but also by achieving the company's objective and creating an opportunity to increase stakeholder value.

The definition of ERM by COSO (2004) referred to it being *"applied in strategy setting... regarding the achievement of entity objective."* ERM is directly related to corporate strategy and this linkage will help the enterprise to achieve the firm's core value. Therefore, many organisations shift their ERM perception away from a compliance function to a strategic orientation that enhances value. Enterprise Risk Management, a 2012 survey report by Deloitte Touche Tohmatsu Limited, found that about 80 percent of the businesses considered strategic risk to be a new focus risk area and had started to implement a risk management system. Moreover, 51 percent of the C-Suite¹ respondents reported that a formal strategic risk management process would help to better integrate all of the risks with the short-term and long-term aims of the management strategy in order to enhance the company's objective.

¹ C-Suite is considered to be the most important and influential group of individuals at a company. The term is derived from the use of the letter C in most high-level positions and the word "Chief" in their titles, such as Chief Executive Officer, Chief Operating Officer and Chief Information Officer.

2.5.4 Evidence of ERM Existence

If an organisation has implemented ERM then there should be observable evidence of this (S&P, 2005). The ERM infrastructure consists of an overall risk management policy, a designed risk management framework, risk assessment guidance, including risk appetite and risk tolerance, the presence of risk management on the board's agenda and clarity of its role and responsibility, as well as any risk report and portfolio view of risk (Protiviti, 2006). Additionally, ISO (31000) is used as the basis of recommendations for reaction planning for hazard risks. Furthermore, evidence of continuity planning, disaster recovery planning or crisis planning should be established and regularly tested. This is required in order to support effective risk management through the enterprise's risk architectural strategy and their protocol.

2.5.4.1 Risk Management Policy

Risk management policy is an effective method to introduce risk awareness throughout the firm. It is a general principle with specific guidelines that are relevant to all aspects of the management of risk. It should be developed and communicated to all staff throughout an enterprise so that they understand the policy in the same way (Moeller, 2007) and apply it thoughtfully, conscientiously and consistently across the entire enterprise (COSO, 2004). Risk management policy includes an entity's risk management philosophy, which is the basis for effective risk management. It provides an appropriate foundation of the entity's values, shared beliefs, attitudes and risk awareness culture on how the firm considers risk in their business, ranging from strategy setting and development to operation activities. The policy should be reflected in virtually everything the management does in running an effective risk management program. Even when risk management policy is well developed and the practices understood, it nonetheless needs to be embraced by its staff and reinforced by management. The policy is not only a written document, but is also carried out in the everyday operation of the organisation, as its procedures affect the company's policy (COSO, 2004). ISO 31000 (2009) points out that risk management policy should state the company's objective, accountabilities &

responsibilities for managing risk, as well as the framework of the overall risk management process.

The risk management policy, which is aligned with the company's objective, should be acknowledged across the enterprise at every level and unit. It should also be fully supported by the board of directors if the implementation of ERM is to be effective (Hopkin, 2012, Protiviti, 2006, Fraser and Simkins, 2010). The employees should consider the risks by being aware of the accountability for risk and risk management, which is more than just on the monetary level (Moeller, 2007).

2.5.4.2 Risk Management framework or guidelines

ISO 31000 (2009) gives a definition of risk management framework, which is a *"set of components that provide the foundations and organizational arrangements for designing, implementing, monitoring, reviewing and continually improving risk management throughout the organization"*. There are various definitions and frameworks for ERM: COSO ERM framework (COSO, 2004), Casualty Actuarial Society framework (CAS, 2003), International Standard for Risk Management (ISO 31000, 2009), Standard and Poor's ERM rating (S&P's ERM rating). All of these frameworks attempt to provide common principles and guidelines on making risk management effective.

Although companies use international standards, such as COSO (2004), ISO 31000 or CAS (2003), as the foundation of risk management process, each company might have different ways of implementing the risk management process that need to take into account the varying needs of the specific objectives, context, structure, processes, functions, products, services, assets and specific practices that are used (ISO 31000, 2009). Shortreed (2010) pointed out that the management must understand both the external and internal business context before designing the ERM framework. The context will determine the related risk that is faced by the firm, confirm the benefits of risk management, assist in the preparation of resources and emphasise both the need for various components of the ERM framework and the risk management processes.

2.5.4.3 Risk Appetite

Risk appetite is “*the amount of risk, on a broad level, an entity is willing to accept in pursuit of value*” (COSO, 2004) and referred to as the “*amount and type of risk an organization is prepared to pursue or take*” (ISO 31000, 2009). To enhance the company’s objective, it unavoidably has to take a higher level of risk. All of the companies have to determine their risk appetite and what is an acceptable risk within the company in order to ensure that it has the potential to achieve its objective (Shortreed, 2010). A risk appetite should be informed and reasonably predicted according to the criteria in risk evaluation, in order to find the best way to deal with acceptable risk in a systematic way. The company's risk appetite might be different across industries and companies (Beasley and Frigo, 2010). The thresholds of its formal risk appetite should be set by the management and the board of directors and applied throughout the company. “*Everyone must understand the organization’s particular drivers of risk, its risk appetite, and what management considers acceptable risk levels.*” (Beasley and Frigo, 2010)

The management needs to decide on how much risk it finds acceptable in order to achieve the company’s objective, as well as sustainable growth. Risk appetite is one of the elements of ERM implementation that corresponds with the COSO ERM definition of managing “... *risk to be within its risk appetite, to provide reasonable assurance regarding the achievement of entity objectives*”. It is fundamental to set the overall risk appetite and manage risks within this. COSO (2004) point out that management should consider the firm’s overall risk appetite, which should be aligned with the entity’s strategy, mission and objective on value creation, as well as how it develops the infrastructure to manage risks and allocate resources among its business unit. In setting the risk appetite, many firms prefer to apply a risk map or risk matrix (impact and likelihood analysis) on categories such as high, medium and low. To gain an effective risk management culture, the risk appetite framework should be formally established, well defined and supported by a clear rational policy that is consistent with ERM, and well communicated throughout the firm (S&P, 2013).

2.5.4.4 Risk Tolerance

An effective ERM framework is critical in order to manage risk within risk tolerance (S&P, 2013). Risk tolerance is *“the acceptable level of variation relative to achievement of a specific objective”* (COSO, 2004), whilst S&P (2013) refers to risk tolerance as a “quantitative risk appetite statement” that guides management in the selection of risk and points out the maximum losses that are acceptable. The organisation should have a clear rationale for supporting the chosen risk tolerance that is directly related to the company’s strategic goal, resources and value proposition, and aligned with their risk appetite. The units of risk tolerance can be the same as the units used to measure the company’s achievement. Management should operate within stated risk tolerances and risk appetite in order to ensure that the firm will achieve an objective from an entity level portfolio perspective.

2.5.4.5 Portfolio View of Risk

ERM has emerged as a new approach for boards of directors and management to better manage the portfolio of risk that is facing companies (Beasley et al., 2005). A fundamental concept of ERM concerns the organisational level that requires risk to be considered from an entity level or portfolio perspective of risk (COSO, 2004; ISO 31000; S&P, 2013). Each manager or person responsible for a business unit, department, function, process or activity is required to develop a risk assessment for each unit and manage it within the unit’s risk tolerance. Every business unit must prepare a portfolio view of risk that they can manage and control separately for a particular unit. This method of assessment can be quantitative or qualitative. By gathering risk at each level to entity level, the management has a responsibility to combine the overall risk portfolio and identify any opportunities that might have a chance of being successful. Management also determines whether the entity’s risk portfolio is within the overall risk appetite of the company. In cases where a risk portfolio illustrates significantly less than the entity’s risk appetite, management can decide to inform each unit to accept more risk in a specific area in order to enhance the company’s return and growth.

The portfolio view of risk that is generally used in the COSO ERM framework can be called the “risk register” (Pergler, 2012) or “risk profile” (S&P, 2013 and ISO 31000, 2009), or other names that similarly mean a set of risks that relate either to the whole or part of the company. A clear vision and understanding of the enterprise risk register/risk profile/risk portfolio is necessary to create an effective risk management culture throughout the company (S&P, 2013).

2.5.4.6 Crisis Management and Business Continuity

Unexpected events can arise in the crisis of uncertainty when the organisation might be exposed to different unanticipated operational risks. ISO (31000) focuses on the scope of the different responses to risk that are available to deal with hazard risks. Disaster recovery planning/crisis planning documentation should be written by the organisation and there should be regular testing of supporting effective risk management, including the enterprise’s risk architecture strategy and protocol. Moreover, there is a concept of business continuity management (BCM) approach. This is developed by considering both the effective prevention and minimisation of losses. It is a broader concept than crisis management, which mainly focuses on recovery during disaster recovery periods (Stanton, 2005). BCM is a step-by-step approach that integrates the principle of ongoing risk management, impact analysis and the contingency plan to ensure that the enterprise has security protection and there is no significant disruption of their main business operations.

2.5.4.7 Control Self-Assessment

The IIA (1998) defines control self-assessment (CSA) as *“a process through which internal control effective is examined and assessed. The objective is to provide reasonable assurance that all business objectives will be met”*. CSA is a management tool that assists in identifying and monitoring the effectiveness of internal controls in achieving objectives and managing their related risks (Caffyn, 1999). CSA has two types of implementation processes and management risk assessments (MRA), which assist in managing risk by evaluating the strengths and weaknesses of controls. They also manage to improve both the firm’s performance and process risk assessment (PRA), which focuses on a particular risk and is more of

a control on the business process itself. Performing CSA involves self-auditing and self-assessment by the board of directors and allows staff to be more intimate with the process of operation. It quickly focuses on key risk, gives more coverage of the important issue, and enables closer monitoring than traditional audits by an internal audit. The benefits of CSA lead to an improved operation, as well as greater responsibility and accountability for effective and efficient control and risk management.

2.5.5 Risk Management Structure and Architecture

COSO (2004) identified the risk management organisational structure in the internal environment, which is one of the main COSO ERM's components. Similarly, the risk management structure can be thought of as the capstone component of ERM. A formal, well defined and independent ERM organisational structure is basic to an effective ERM implementation (S&P, 2005).

It is commonly recognised that the board of directors has the ultimate responsibility to ensure that there is an appropriate internal control and risk management system. Management should identify and evaluate the risk that is faced by the company, so that the board of directors can create a suitable system of risk management through its policy (Turnbull, 1998). The company's ERM system should have a well-organised structure to allow the boards to periodically review and monitor existing risk, while also fulfilling their oversight responsibility. Branson (2010) mentioned: *"The board must consider the best organizational structure to give risk oversight sufficient attention at the board level."* Grace et al. (2015) also found that there is a positive relationship between the risk report to the board of directors or the CEO and the firm's operating performance.

The structure depends on each company, so there is no best structure that can be recommended. Many boards have realised the benefits of assigning the main risk oversight duty to a committee of the full board because of the scope and complexity of ERM. Therefore, many companies establish a separate risk management committee in order to increase both attention and mandate risk management

oversight. For other companies, risk is periodically reviewed in regular meetings of the audit committee. Branson (2010) pointed out that:

"The audit committee may not always be the best choice for providing direct oversight of the ERM program at the board level because the audit committee typically has a crowded meeting agenda and may not have sufficient time and resources to devote to the optimal level of risk oversight. In addition, the audit committee's focus on compliance with financial reporting rules and auditing standards is not necessarily the best approach for understanding the broad array of risks faced by their organization."

To identify an ERM implementation firm, many researchers use evidence of the existing CRO and risk management committee, which form an independent risk management structure that is established by the risk management committee, CRO and risk management department. Their direct risk function is separated from the fundamental control structure as it is under the internal control department and audit committee. Therefore, if there is a risk management committee with the CRO as chair implementing the ERM program with a dedicated risk management unit, one may regard the organisation as having an effective supervision of risk.

Either the risk management committee or audit committee, who are assigned by the board, should be accountable for overseeing the risk management process and should receive regular reports from senior managers responsible for risk management, such as the CFO or CRO. The CRO or CFO supports the board (or a designated board committee) and will facilitate the execution of the ERM process and infrastructures. This role can be both consultative and authoritarian. It should assess, recommend or approve, depending on the area of risk (Protiviti, 2006). After that, the stated committee should periodically prepare a report to the whole board in order to monitor the ERM programme and ensure that the risk management process is still effective and engages risk with a strategy that will accomplish the company's goal.

2.5.6 Responsibility/Accountability

AON (2010) pointed out that in order to leverage existing best practices in implementing an ERM framework, it is essential to engage with clear lines of responsibility, authority and accountability from the board through to management levels, and then to the operational levels. Ittner and Oyon (2014) also found a

positive relationship between ERM and the functional and hierarchical extent of risk ownership. By appointing the right person to the right role, with a clear segregation of duties, an equilibrium between risk-taking and risk monitoring (KPMG, 2010) can be maintained. The problem of accountability can rise when risk is not identified and linked to the ownership of risk. Ansell and Harrison (2014) stated that the ownership of risk and its governance are linked to perceptions of accountability. Unfortunately, some risks are not managed because there is no assignment of ownership and so there is a lack of accountability or responsibility. In other cases, the distribution of accountability may be spread so there are differing perceptions of responsibility. Andreeva et al. (2014) proposed the "knowledgeable supervision" concept, which aims to solve the accountability problem within the context of public risk. This comprises of four key characteristics: the co-ordinating role, shared responsibility, interdependence and authority versus accountability. This concept shifts from an authority concept to knowledgeable, governance, as well as accountability, which could apply within the enterprise and to stakeholders to encourage each silo department to work together.

Moreover, Moeller (2007) points out that all individuals at all levels in the firm should be able to acknowledge their role, as well as their accountability to the risk management process, and contribute to achieving the company's objective through a well-established communication channels and appropriate knowledge. The enterprise should have a systematic periodic risk report system (Deloitte, 2009) and its reporting should flow up from the bottom to senior management and the board of directors. A key feature of ERM is that all members of the company have a responsibility to support the company's risk policy and promote compliance within its risk appetite (COSO, 2004, AON, 2010, Chapman, 2011). The board of directors has the final responsibility and ownership of the oversight of ERM (COSO, 2004, AON, 2010, Chapman, 2011, S&P, 2013, Deloitte, 2009), with a periodic risk report system (Deloitte, 2009) and appropriate delegate risk management roles (KPMG, 2010) that are assigned to the risk leader and to the CRO (Mikes, 2010, Aabo et al., 2005, Gates, 2006) or risk management committee (AON, 2010).

The concept of ERM as a centralised risk process helps boards and top management to think about risk more holistically and link it to strategic decisions. The oversight of risk management should be an acknowledged responsibility of the board of directors. The importance of this responsibility has gained the close attention of most firms as a result of the global financial crisis, which had the effect of increasing awareness and recognition of ineffective risk management and creating a risk aware culture across listed companies. To successfully implement ERM management, one has to be in a suitable position to evaluate varied strategic directions by considering the combined risks within many scenarios to create a potential for risk opportunities and to manage risk within the stakeholders' risk appetite. All of the identified risks inclusively aim to support the strategic direction of the enterprise. ERM might identify risk opportunity across multiple silos of the enterprise in order to enhance and maximise the value of the company's return when risk appetite is well managed by balancing the performance objective with recognising risks.

Boards of directors are normally held accountable and responsible for considering risk oversight and it is important to consider the likelihood and impact of various risk scenarios that are linked to the company's overall business strategies. The board should be responsible for determining the nature and extent of significant risk (UK Corporate Governance Code, 2010). In many companies the risk management committee may be established as a sub-committee of the board to increase risk management oversight at board level, which is the ideal structure of effective risk management (Hume, 2010). Since there are limited resources and time constraints on the audit committee, it would appear that an effective ERM structure should establish a dedicated risk management committee of the board (Simkins, 2008). The committee should have the head of the ERM function and is usually led by CRO who directly reports to the board. This helps the board to pay greater attention and oversight to the company's risk management process.

It is important to be cautious, as PwC's 2012 Annual Corporate Directors' Survey indicated that directors perceive oversight risk as a vital responsibility of the board of directors. The Company's Annual Report shows the majority of companies view risk oversight as the board of directors' responsibility and function, and a few companies

in the non-financial service sector have a risk committee. However, approximately 37 percent of directors in the survey believed that when it comes to major risks facing businesses, there is no specific allocation of responsibilities among the board of directors and its committee. They are not sure who on the board of directors is supposed to respond to risks. The risk oversight gap and structural disconnect might cause problems in the long run if the directors are unsure about ownership of overseeing the risks. Hence, it is essential to allocate ownership of risk to an appropriate level or responsible person (HM Treasury, 2001).

2.5.7 Risk Management Process

An effective ERM implement process starts with identifying and controlling risk, and then having effective communication throughout the firm, having training and developing the knowledge at the management and staff level, having adequate technology and an information system that will support the risk management system and monitor risk management on a timely basis.

2.5.7.1 Identifying Internal Control and Managing Risk

“If you know the enemy and know yourself, you need not fear the result of a hundred battles. If you know yourself but not the enemy, for every victory gained you will also suffer a defeat. If you know neither the enemy nor yourself, you will succumb in every battle.”

Sun Tzu, The Art of War

It can be relatively simple to identify risk in some situations, but in many other situations it is not simple at all. The volatility and complexity of the business can shape unexpected events away from management oversight. Occasionally, it is possible that risks are not identified, so they are not likely to be managed well. There is unfortunately no definitive answer as how to categorise risk, and what exact type of risks a company faces as the type of risk will depend on each business context (Segal, 2011, Chapman, 2011). It is necessary to understand the events that have a potentially negative impact on the firm overall. The source of risk and the system to be used to examine risk are critical components in the process of risk identification and facilitate the risk planning process and the appropriate establishment of a company's risk register that will manage risk effectively (Pritchard, 2010). Segal

(2011) mentioned that the key success of risk identification is principally related to constructing a comprehensive list of possible risk, which is related to risk categorisation and definition.

Table 2.5 shows there are different views amongst authors about the sources of risk, which originate from related events and changes to a situation. Strategic risk (CAS, 2003, COSO, 2004, Chapman, 2011) has just been included as a new category of risk since there have been recent developments in ERM. If a wide scope type of risk is considered, risk can be split into two categories – internal risk and external risk that affects the enterprise. When events that are related to classification are considered, it can be summarised as the main scope of risk in the following ways:

1. Strategic risk
2. Reputational risk
3. External risk: natural and man-made risk, country risk, economic risk, political risk, business risk, market risk, industry risk and social-cultural risk
4. Internal Risk: financial risk, operational risk, reporting risk, compliance risk, informational and technological risk
5. Specified industry risk e.g. banking sector: capital risk and liquidity risk

A company also needs to consider the timescale of risk impact, which can be long, medium or short-term. This is necessary to analyse the risk exposure faced by a firm (Hopkin, 2012), except for systematic risk or known risk, which should be identified. Importantly, the DEFRA² risk strategy states that the risk management approach should be “objective-driven” and be better at identifying longer-term risk or risks that are currently over the horizon, which will depend on good stakeholder participation and a good process of gathering risk. DEFRA stated that: *“This should be a living process, not a tick-box approach and must not become bureaucratic.”* It is important to gain attention and carry out “surveillance” in order to identify new events or significant change that might create future risks and affect the company’s objective.

² Department of the Environment, Food and Rural Affairs (DEFRA) published their *Risk Management Strategy* in 2002 (DEFRA 2002). While the approach is now very familiar, in terms of the stages of risk management and the risk response categories adopted, careful thought has been given to what risk management means for the department.

Table 2.5 Summary of the most common types of risk

Type of Risk	COSO (2004)	CAS (2003)	Friend and Zehle (2009)	Chapman (2011)	Olsson (2002)	Cooper (2006)	Holliwell (1998)	BSI (2001)	HM Treasury's (2001)	HM Treasury's (2004)
Strategic risk	/	/		/						
External risk				/					/	
Hazards risk		/					/	/	/	
Country risk				/	/		/			/
Economic risk				/			/		/	
Political risk			/	/	/		/		/	/
Business/Industry risk			/		/	/	/	/		
Market risk				/	/	/	/	/	/	
Socio-cultural risk										/
Internal Risk:										
Financial Risk		/	/	/	/		/	/	/	
Credit risk				/	/	/	/		/	
Interest rate risk							/			
Foreign exchange risk				/			/			
Equity price risk										
Liquidity risk				/	/	/			/	
Capital management risk				/					/	
Fraud risk							/	/	/	
Insurable risk								/	/	

Type of Risk (Continue)	COSO (2004)	CAS (2003)	Friend and Zehe (2004)	Chapman (2011)	Olsson (2002)	Cooper (2004)	Holliwell (1998)	BSI (2001)	HM Treasury's (2001)	HM Treasury's (2004)
Operational Risk	/	/	/	/	/		/		/	/
Personnel risk				/			/	/	/	
Safety risk				/		/		/	/	
Health risk				/		/		/	/	
Environmental risk				/	/	/	/	/	/	/
Product risk							/	/		/
Resource risk							/	/	/	/
Competitor risk							/	/		
Project risk				/					/	/
Innovation risk									/	
Transferable risk									/	
Relationship risk										/
Reporting risk	/				/			/		
Compliance risk	/			/	/	/		/	/	/
Reputational risk					/	/	/	/	/	/
Informational risk				/		/	/	/	/	/
Other types of risks										
Risk management				/						/
performance risk										
Governance risk										/
Scanning risk										/
Resilience risk										/
Change risk										/

2.5.7.2 Training and Development

Everyone in an organisation should be responsible for risk management (Giddens, 1999). Good people or "knowledgeable people" (Moeller, 2007) are important in implementing the effectiveness of the ERM program by enhancing the risk culture across the enterprise. It is therefore critical to ensure that related staff have appropriate risk knowledge and are competent and capable with the right qualifications in risk management to perform their responsibility (PWC, 2008a). A formal risk knowledge management and training program should be launched at both the board of directors' level, including executive and non-executives directors, and staff level. There also needs to be adequate time and enough effort to cultivate risk awareness in their mindset (KPMG, 2010). In fact, Hillson (1997) mentioned that it is not enough to only use short-term staff training to embed ERM. For a risk awareness culture to be established, it might require ERM to be embedded into their work routine and job description. This training program should be an ongoing process, which is tailored and reviewed to be most relevant to the company and related to its business (Branson, 2010).

The survey of the role and effectiveness of non-executive directors by Higgs and Britain (2003) indicated that two-third of the total number of non-executives and chairmen have not received any training and development. Training and development, particularly on the boards and senior management level, is essential to the successful implementation of ERM programs, as it requires an understanding of the fundamentals of risk. This is because top level managers should have adequate risk experience and an intimate knowledge to understand the overall risk management program in order to make a meaningful assessment of the risks and carry out the policy in place (Deloitte, 2009). In addition, it is fundamental to the company's operation that current business development and specialised issues should be rolled out so that boards can better consider the implications of the key risks that they might face and plan their response to these risks thoughtfully. Moreover, Higgs and Britain (2003) suggested that training should be developed beyond class formal training. There is a need to develop suitable technical knowledge, which is sufficient and tailored to the board's responsibilities. Training programs could be organised

through workshops or within the structure of the board meeting schedule, depending on how essential they are.

Risk training for other staff should answer the employees' questions about risk management (such as who is involved in the ERM process, why it needs to be implemented, what are the benefits and how to do it, etc). Training increases staff understanding of the ERM program by making them aware of the objective and benefits, as well as the framework and process of ERM, the company's risk management policy and the problems created by an inactive ERM program. After the training process finishes, the knowledge should increase their readiness to be part of the process and apply it to their jobs (Chapman, 2011). After constructing proper training sessions to ensure that there is sufficient knowledge transfer throughout the enterprise, Toneguzzo (2010) suggests that a percentage of staff have completed the training programs (training factors) and should be included in the measure of success as key performance indicators (KPIs). Therefore, the more risk management training is offered to staff and directors, the more effective the risk management program should be.

2.5.7.3 Monitoring

OGC (2002) stated that risks should be "*actively monitored and regularly reviewed on a constructive 'no-blame' basis*". The last critical component to achieve effective risk management is monitoring, which must be done on a timely basis (AICPA, 2010, Deloitte, 2011, PWC, 2008b) and embedded into the business process as a part of the culture (Chapman, 2011). Monitoring is the process of observation from outside any event and its purpose is to ensure that the overall risk management process is executed and controlled as the planning process is constructed and actively proceeds. Besides the regularly reviewing of controls and processes, monitoring should be a robust practice. This process might indicate new risks and opportunities arising across all the business sectors of the company, which is helpful to improve its future risk management process. For example, the gathering of information about risks in the past, as well as emerging risks for external circumstances, can be used to

update the company's risk profiles for later use. For assurance, the board of directors has responsibility for monitoring the overall risks facing the company.

There are many procedures that help companies to manage the continuous monitoring of risk, including early warning indicator systems (Kaminsky et al., 1998), benchmarking against policy or the best practice (Chapman, 2011), performance management appraisals, such as the general operational performance and financial ratio, Balanced Scorecards (BSC) or Key Performance Indicators (KPI) (Hwang, 2010, Beasley and Frigo, 2010, MacDonald, 2002), as well as a timely reporting system method to management (AICPA, 2010, Deloitte, 2011, PWC, 2008b).

In summary, the main components of ERM, taken from various internationally accepted ERM frameworks and previous literature about effective ERM implementation consists of 40 components which can be gathered into 6 categories. The 6 categories are as follows: 1) The fundamentals of ERM; 2) The existence of ERM evidence; 3) Risk Management Structure and Architecture; 4) Risk management policy and risk appetite; 5) Responsibilities and accountability and 6) Risk Management Process, as shown in Table 2.6. In practice, the design and implementation of ERM frameworks might significantly differ amongst various enterprises, but there are common components of ERM that have led to best practice in ERM. The desire to improve ERM implementation means these components can be considered in order to achieve a more effective risk management system or to ensure that a risk management program is in place.

Table 2.6 The components of ERM from various internationally accepted ERM frameworks and previous literature

ERM Component	COSO (2004)	ISO (2009)	CAS (2003)	S&P (2013)	Other Literatures
<u>1) Fundamentals of ERM</u>					
Strategic decisions involving board or top management level	/	/			(Protiviti, 2006, Accenture, 2011, AICPA, 2010, AON, 2010, Chapman, 2011, Moeller, 2007, Fraser and Simkins, 2010)
The presence of identified aligned business risks into the company's routine corporate and business unit	/	/	/	/	(Protiviti, 2006, KPMG, 2010, Moeller, 2007)
Concerning risk oversight/management aligned with the company's strategy	/	/	/	/	(Accenture, 2011, Protiviti, 2006, AON, 2010, Moeller, 2007)
Realised benefits of risk management address	/	/	/	/	(Hampton, 2009, Accenture, 2011, Protiviti, 2006, PWC, 2008b, Chapman, 2011)
Perceived benefits of ERM adoption	/	/	/	/	(Hampton, 2009, Accenture, 2011, Protiviti, 2006, PWC, 2008b, Chapman, 2011)
<u>2) The existence of ERM evidence</u>					
Business continuity plan – evidence prepared		/			(Hopkin, 2012)
Crisis management – evidence prepared			/		(Hopkin, 2012)
Self Control Assessment by boards – evidence prepared		/			(Protiviti, 2006)
Self Control Assessments by all staff – evidence of prepared		/			(Protiviti, 2006)
Risk Management Policy - evidence prepared	/	/		/	(Hopkin, 2012, Protiviti, 2006, Deloitte, 2009, KPMG, 2010, Chapman, 2011, Fraser and Simkins, 2010)
Risk Management Policy – evidence reviewed	/	/		/	(Hopkin, 2012, Protiviti, 2006, Deloitte, 2009, KPMG, 2010, Chapman, 2011, Fraser and Simkins, 2010)
Risk Management Framework or guidelines – evidence prepared	/	/	/	/	(Moeller, 2007, Chapman, 2011)
Risk Management Framework or guidelines – evidence reviewed	/			/	(Chapman, 2011)
Risk Appetite – evidence prepared	/	/		/	(AON, 2010, KPMG, 2010, Abdel-Khalik, 2013)
Risk Appetite – evidence reviewed	/			/	(AON, 2010, KPMG, 2010, Abdel-Khalik, 2013)
<i>(continued)</i>					

Variable Description (Name)	COSO (2004)	ISO (2009)	CAS (2003)	S&P (2013)	Other Literatures
Risk Tolerances – evidence prepared	/	/	/	/	(AON, 2010)
Risk Tolerances – evidence reviewed	/			/	(AON, 2010)
Risk Register/ Risk Profile/Risk Portfolio – evidence prepared	/	/	/	/	(AICPA, 2010, AON, 2010, KPMG, 2010, Chapman, 2011)
Risk Register/ Risk Profile/Risk Portfolio – evidence reviewed	/			/	(AICPA, 2010, AON, 2010, KPMG, 2010, Chapman, 2011)
<u>3) Risk Management Structure and Architecture</u>					
Existence of a risk management committee			/		(Hoyt and Liebenberg, 2011, Liebenberg and Hoyt, 2003)
Existence of a risk management department			/		(Hoyt and Liebenberg, 2011, Liebenberg and Hoyt, 2003)
Existence of a risk management structure			/		(Accenture, 2011, Deloitte, 2009, KPMG, 2010, PWC, 2008b, Chapman, 2011)
<u>4) Risk management policy and risk appetite</u>					
Acknowledgement of risk management policy	/	/		/	(Hopkin, 2012, Protiviti, 2006, Fraser and Simkins, 2010)
The level of companies applying risk management policy	/	/		/	(Accenture, 2011, Protiviti, 2006)
Determining of risk appetite	/	/		/	(AON, 2010, KPMG, 2010)
<u>5) Responsibilities and accountability</u>					
Frequency that board of directors have discussed or received reporting on risk management	/	/	/	/	(Deloitte, 2011, Grace et al., 2015)
The independence of risk management committee			/		(AON, 2010)
Board of directors responsible for the overall risk management process activities of the entity level	/	/		/	(Deloitte, 2009, AON, 2010, Chapman, 2011)
Risk management committee, Chief Risk Officer and risk management department responsible for risk management process			/		(AON, 2010, Hoyt and Liebenberg, 2011, Liebenberg and Hoyt, 2003)
All staff in the company involved in risk management process	/	/	/	/	(AON, 2010, Chapman, 2011)
<u>6) Risk Management Process</u>					
Identifying strategic risk	/	/	/	/	(Chapman, 2011, Deloitte, 2009)
Identifying reputation risk (continued)		/	/	/	(Chapman, 2011)

ERM Component	COSO (2004)	ISO (2009)	CAS (2003)	S&P (2013)	Other Literatures
Having clear documents or standards for risk taking and risk management that are widely understood within the company	/	/		/	(AICPA, 2010, PWC, 2008b, AON, 2010, Deloitte, 2011, KPMG, 2010, Chapman, 2011)
Having clear communication of risk disclosure to stakeholders	/	/		/	(Chapman, 2011, Miihkinen, 2012, Ahmed et al., 2004)
Existence of components needed for effective risk communication	/	/		/	(Chapman, 2011, Beretta and Bozzolan, 2004)
Existence of training, coaching or educational programs about risk management that is offered to director	/	/			(Deloitte, 2009, AON, 2010, KPMG, 2010)
Existence of training, coaching or educational programs about risk management that is offered to staff	/	/			(Deloitte, 2009, AON, 2010, KPMG, 2010)
Existence of risk information systems that provide adequate information that is able to identify, assess and respond to risk	/	/		/	(Deloitte, 2009, AON, 2010, KPMG, 2010)
Having assigned a responsible person to monitor overall risk management on a timely basis	/	/	/	/	(AICPA, 2010, Deloitte, 2011, PWC, 2008b)
Existence of techniques or methods used to monitor risk management					(Chapman, 2011)

2.6 Measuring ERM Implementation

For the last decade, academic researchers and practitioners have conducted studies into the implementation and characteristics of ERM (Fraser and Simkins, 2010). The streams of ERM studies can be grouped into four main categories. Firstly, those investigating ERM practice and characteristics (e.g. Colquitt et al., 1999, Kleffner et al., 2003). Secondly, those making an in-depth case study of ERM in each business sector (e.g. Harrington et al., 2009, Aabo et al., 2005, Stroh, 2005, Acharyya, 2009, Mikes and Kaplan, 2013). Thirdly, those studying the relationship between ERM implementation and value creation (e.g. Gordon et al., 2009, Grace et al., 2015, Hoyt and Liebenberg, 2011, McShane et al., 2011, Pooser, 2012, Eckles et al., 2014). Lastly, those analysing the implementation of ERM determinants (e.g. Liebenberg and Hoyt, 2003, Beasley et al., 2005, Hoyt and Liebenberg, 2011, Pagach and Warr, 2011, Razali et al., 2011, Golshan and Rasid, 2012).

Recently, many critics have been concerned about the quality of the measurement of ERM implementation, which has hindered a definite understanding of the relationship between ERM and other aspects of the firm, such as performance (e.g. Mikes and Kaplan, 2013, Kraus and Lehner, 2012, Iyer and Rogers, 2010). This has also had an impact on studies of ERM and other behaviours, e.g. the firm's performance and determinants of ERM. In this part, ERM measurements from past studies will be identified and this problem will be clarified.

Prior studies can be divided into three main categories. These are studies that:

1. Use the ERM proxy approach, which used keywords as a proxy for ERM implementation (e.g. Hoyt and Liebenberg, 2011, Liebenberg and Hoyt, 2003, Eckles et al., 2014, Tahir and Razali, 2011, Beasley et al., 2008, Pagach and Warr, 2010).
2. Use the ERM rating data from S&P (e.g. Pooser, 2012, McShane et al., 2011, Lin et al., 2012).
3. Use the ERM index combined with other risk measurements (e.g. Gordon et al., 2009, Grace et al., 2015, Quon et al., 2012).

2.6.1 Proxy Search

Most popular methodologies have used ERM proxy, such as ERM keywords or CRO keywords, rather than attempting to measure implementation directly (e.g. Hoyt and Liebenberg, 2011, Eckles et al., 2014, Beasley et al., 2008, Pagach and Warr, 2010, Tahir and Razali, 2011, Liebenberg and Hoyt, 2003). Kraus and Lehner (2012) found that the keyword search methodology was employed in ten out of the twenty-five studies. Six studies used keywords as the variable and four other studies combined both a keyword search with either the S&P's ERM rating. The proxy for ERM that was used in identification was the appointment of a CRO or finding synonymous phrases that were equivalent to ERM. The keywords included the following phrases, their acronyms, as well as individual words within the same paragraph:

- “Enterprise risk management”
- “Chief Risk Officer”
- “Risk Committee”
- “Strategic Risk Management”
- “Consolidated Risk Management”
- “Holistic Risk Management”
- “Integrated Risk Management”

A proxy search has its limitation because it cannot measure the different forms of ERM implementation. One of the problems is that CRO might not be responsible for the enterprise risk management of the company. While finance-related and insurance companies might assign CRO to manage their risk processes, many non-financial companies assigned a CFO to implement their ERM. A proxy search might not measure different levels of ERM implementation in the firm. However, the trend of using proxy to classify ERM implementation is still ongoing in current research (Mikes and Kaplan, 2013, Fraser and Simkins, 2010).

2.6.2 ERM Rating from Standard and Poor's

There are other alternatives. Some researchers based the measurement of ERM on Standard and Poor's ERM ratings. S&P introduced a criterion for assessing ERM in insurers (S&P, 2006). S&P expanded and integrated the ERM characteristics into the S&P index for insurance, banking and non-financial firms. S&P divided ERM Quality Scale into four categories: weak, adequate, strong and excellent. In 2009, the S&P scale was revised into five insurers of ERM, which were weak, adequate, adequate with risk controls, strong and very strong (S&P, 2010). From the S&P index classification of ERM, the weak and adequate levels can be described as TRM, while strong and excellent levels can be described as ERM (McShane et al., 2011).

McShane et al. (2011) studied 82 publicly trading US insurers and they used the ERM rating in five categories. By using Tobin's Q as a firm measurement, they found a positive relationship between ERM rating and firm value over three categories, which were weak, adequate and adequate, with a positive trend which is the level of TRM capability. There were no additional increases in value for firms, as the ratings of strong and excellent were the ERM level. On the other hand, Baxter et al. (2013) found the high-quality ERM company rating by S&P was positive to ROA and Tobin's Q in banks and insurance companies with the sample containing 165 firms- year observations.

While Lin et al. (2012) and Pooser (2012) used a combined method that employed a proxy search and S&P ERM rating as ERM measures. Both studies considered property and casualty insurance in the US market. The results that were obtained were contradictory. Lin et al. (2012) indicated that a strong negative correlation between firm value and ERM, with a 5% discount of Tobin's Q and 4% of ROA. While Pooser (2012) found that the effectiveness of an ERM program reduces or prevents shocks to the firm's performance.

2.6.3 ERM Index Method

As a result of limitations in the use of variables of ERM, as mentioned above, researchers have developed a new ERM measurement called the ERM index (Mikes

and Kaplan, 2013). The ERM index was formed by each author through an ERM specific component and used secondary data to find the components. The ERM index was developed by gathering each type of risk or risk component (e.g. Gordon et al., 2009, Grace et al., 2015, Quon et al., 2012). Gordon et al. (2009) and Desender and Lafuente (2010) used the ERM COSO framework to develop their index, whilst Quon et al. (2012) developed their own specific index and Grace et al. (2015) used a combination between the keyword search and their own specific index.

Gordon et al. (2009) developed a COSO ERM effectiveness index based on a firm's capability to accomplish its strategy, operations, reporting and compliance objectives. The indicators measured the effectiveness of ERM by using: Strategy 1 = the number of standard deviations in its sales deviates from the industry sales; Strategy 2 = a firm's reduction in beta risks, relative to the other firms in the same industry; Operation 1 = sales to total assets; Operation 2 = sales divided by the number of employees; Reporting 1 = the combination of material weakness, auditor opinion and restatement; Reporting 2 = the relative proportion of the absolute value of normal accruals divided by the sum of the absolute value of normal and abnormal accruals; Compliance 1 = auditor's fees by total assets; Compliance 2 = settlement net gains (losses) to total assets. Most of the ERM components were mostly accounting calculations that had been kept from annual reports, websites and newspaper articles in 2005.

Another approach was to use COSO to form an ERM index that Desender and Lafuente (2010) developed by creating a number of questions about ERM. This resulted in a list of 70 items which could be scored either zero (absence) or one (presence) under the eight dimensions of the COSO ERM framework: ERM: 1) internal environment, 2) objective setting, 3) event identification, 4) risk assessment, 5) risk response, 6) control activities, 7) information and communication, and 8) monitoring.

Desender and Lafuente's ERM index (2010) was modified in their ERM index's questions in 2011 (Desender and Lafuente, 2009), which had a list of 108 questions that aimed to study the relationship between ERM and the audit fee. This method

used ratings that are based on components of information about ERM, and then turned them into a percentage. For example, the objective setting component had a score of 100 percent if the company had information in each criterion, and they would have score on that component. The component of objective setting had information about: 1) the company's mission, 2) the company's strategy, 3) the company's business objectives, 4) adopted benchmarks, 5) approval of the strategy by the board and the link between strategy, 6) objectives and shareholder value.

Quon et al. (2012) developed their own specific ERM index, which examined fourteen different types of risks under the financial, business and operation risk. It identified risks and determined the management for each type of risk, the level of exposure to each risk and the consequences by using content analysis of their annual reports, management discussion and analysis (MD&A), as well as notes to the financial statements from 2007 to 2008. This study concluded that ERM does not have any significant effect on business performance.

Grace et al. (2015) found a significant increase in both the cost and revenue efficiency of insurance by using an ERM survey by Tillinghast Towers Perrin of their worldwide insurance clients between 2004 and 2006. This created 6 variables to evaluate ERM measurements for insurance. These were: 1) the economic capital model (ECM), 2) market value based risk metric, 3) CRO or significant risk management entity, 4) the board, the CFO, the CEO or a committee having responsibility for risk management reports, 5) risk management being used to influence executive compensation, 6) risk being reflected in the firm's decision making.

Most studies used a proxy search as evidence of the company using ERM. Only a few studies tried to use different methods by developing an ERM measurement or using an S&P Risk Management quality scale to determine there was ERM in the firm. Most current ERM measurements still lack a reliable method to construct the ERM implementation level. Therefore, this study will propose an ERM measuring method by integrating well-implemented ERM components, where contributions can be standardised.

2.7 Previous Research of ERM and Firm Performance

General regulators, consultants and corporate governance advocate that the ERM framework can be used to improve a firm's performance. Executives and boards face pressure to adopt ERM from SEC regulation and other regulators. For example, many companies are currently attempting to implement an ERM system from the international organisation standard or guidelines from consultants (Desender and Lafuente, 2010). There is a high level of pressure to implement ERM from academic researchers, people who manage risk, business owners of both financial and non-financial company who are more concerned whether ERM can create value.

The lack of clear empirical evidence that proves the value of ERM might continue to limit the effectiveness of ERM implementation (Hoyt and Liebenberg, 2011). Furthermore, it is costly and takes considerable effort from top senior executives (C-suite³) to implement a successful ERM implementation within an organisation (Beasley et al., 2008). The main challenge is to find out what organisations consider to be the appropriate accountability and responsibility structure that can be used to manage, identify, assess, measure and respond to all types of risk that occur across the enterprise. It is crucial that stakeholders within each organisation perceive the benefit of ERM and recognise why ERM creates value (Nocco and Stulz, 2006).

Smithson and Simkins (2005) carried out a thorough review of the risk management literature and at that stage found no evidence of ERM and its impact on firm value. Of the ten studies that were reviewed, six considered interest rates and foreign exchange (FX) to be risk management and four considered the impact of commodity price risk management to be related to the firm's value. Nine out of ten used Tobin Q as a proxy for the firm's value.

Hoyt and Liebenberg (2011) indicated that there had been no previous study into the overall impact of ERM on the firm's value. They provided initial evidence by focusing on publicly traded US insurance companies. In the study, they made a

³ The C-suite is considered the most important and influential group of individuals at a company. Being a member of this group means you will have a more demanding workload, make high-stakes decisions and earn high levels of compensation. However, as "chief" titles proliferate, job-title inflation may decrease the prestige that is currently associated with being a member of the C-suite.

comparison between ERM and non-ERM insurance companies and their firm's value. As a result, it found a positive relationship between ERM and the firm's performance, based on an ERM premium of around 20 percent that is both statistically and economically significant. For the ERM measuring method, Hoyt and Liebenberg (2011) followed Liebenberg and Hoyt (2003) by using ERM keywords from the financial reports, newswires and other media to identify ERM activity, and estimated the effect of ERM by using Tobin's Q. All of these keywords became generally used by researchers who were interested in studying ERM.

Previous research between ERM and the firm's performance was summarised by Kraus and Lehner (2012). This study categorised ERM and the firm's performance by an ERM measurement method, as shown in Appendix A. Overall, it can be concluded that the relationship between ERM and the firm's performance was inconclusive. Many studies have found the practice of ERM has created value or led to a positive impact on the firm's performance (e.g. Gordon et al., 2009, Grace et al., 2015, Hoyt and Liebenberg, 2011, Eckles et al., 2014, Pooser, 2012, Baxter et al., 2013). In contrast, other studies concluded that there is no significance (e.g. Pagach and Warr, 2010, Lin et al., 2012, McShane et al., 2011, Tahir and Razali, 2011, Quon et al., 2012, Acharyya, 2009). Recently, Lin et al. (2012) found that ERM has a strongly negative correspondence with the firm's value, with a discount of 5% (4%) in terms of Tobin's Q (ROA). This lack of clarity in the findings that related to ERM and the firm's performance means there is now need for a further study (Mikes and Kaplan, 2013, Kraus and Lehner, 2012). Hence, it is still an open question whether the practicing of ERM leads to an increase in a firm's performance.

2.7.1 ERM in the Non-Financial Sector

Moreover, the majority of ERM studies focus on North American companies and especially the insurance sector (Beasley et al., 2005). Due to an increasingly volatile global market, ERM is expected to be the new business instrument for coping with various risks. Therefore, it is not only financial and insurance sectors that implement ERM, but also non-financial sectors, who have continued to develop a growing interest in recent years (Sobel and Reding, 2004, Lajili and Zeghal, 2005). There is,

however, very limited research into the application of ERM in non-financial sectors (e.g. Quon et al., 2012, Gordon et al., 2009, Beasley et al., 2008).

An example of non-financial firms is found in the study by Quon et al. (2012), which studied ERM in connection with a firm's performance by assessing the level of economic or market risk exposure that was related to a firm's performance. They found there was no significant connection between ERM information and business performance. This study used both content analysis of the company's annual reports and the notes to financial statements. In the annual reports, companies distinguished between fourteen types of risk under the general headings of financial, business and operational risks. It only used information that was disclosed on each type of risk, the level of risk exposure and their consequences on company strategy. However, this study analysed the levels of risk assessments without looking at ERM in a holistic manner, which also would have included many other components, such as process, people, communication, risk culture, etc, which is the mainstream of the ERM component.

Another study of the non-financial sector was conducted by Beasley et al. (2008), who studied the market response when firms declared the appointment of a CRO. The study found that the average two-day market response was not significant. However, their multiple regression analysis found there were statistically significant relationships between equity market returns and the firm-specific characteristics of financial firms. By using keywords for ERM, they discovered the firm's announcements of the appointment of a CRO were similar to the other study by Liebenberg and Hoyt (2003).

Gordon et al. (2009) found a positive relationship between ERM and Tobin's Q and stated that ERM should be examined from the perspective of contingency. They stated that the relationship between ERM and firm performance is contingent upon the appropriate match between ERM and five factors affecting the firm: 1) environment uncertainty, 2) industry competition, 3) firm size, 4) firm complexity, and 5) monitoring by the board of directors. Furthermore, their study was based on a sample size of 112 US firms that disclosed the ERM implementation. The study

gathered ERM measurement bases on a 4-risk type that comprised of strategic risk, operational risk, compliance risk and reporting risk from the COSO ERM (2004) framework.

In summary, it can be seen from previous literature that the result of ERM and firm performance is still questionable. Many previous studies involved companies in the insurance sector that lacked a reliable ERM measurement. Hence, a further study is required to create a reliable ERM measure and to prove firm performance in both the financial and non-financial business sector.

2.8 Previous Research Determinants of ERM

The majority of listed companies in both the financial and non-financial sectors have started to implement ERM as a strategic business tool to effectively manage risk at an acceptable level to achieve the company's objective. Schoening-Thiessen and Wyman (2005) found that more than 90 percent of executives from the US and Canadian boards would like to implement ERM. However, only 11 percent had completely done so, according to a 2005 survey. Also, Brown et al. (2014) point out that effective internal control and risk management is a main determinant of financial disclosure transparency; however, there are still questions about what the determinants of effective ERM implementation are. The lack of clear empirical evidence of what firm-specific characteristics influence ERM implementation may inhibit the effectiveness of its implementation. Hence, it is vital to examine which of a firm's characteristics have a significant relationship that is associated with the implementation of ERM.

Similar to the problems of understanding the relationship between ERM and firm performance, most studies on the determinants of an ERM implementation have used ERM proxies, rather than attempting to measure implementation directly (e.g. Liebenberg and Hoyt, 2003, Hoyt and Liebenberg, 2011, Pagach and Warr, 2011, Razali et al., 2011, Golshan and Rasid, 2012). Beasley et al. (2005) determined the ERM stages by using secondary data that was obtained from the Institute of Internal Auditors (IIA).

Moreover, most of the studies are based on firms in the US and especially in the insurance sector. Liebenberg and Hoyt (2003) used CRO proxy as the ERM data of 26 companies in the US during 1997-2001, and suggest that a smaller firm size and greater leverage are a significant determinant of ERM implementation. A further study by Hoyt and Liebenberg (2011) also used ERM and CRO keywords to determine ERM implementation on 125 insurance companies in the US. They proposed that a larger size of firm with less leverage and more institutional ownership are the drivers of ERM adoption. Similarly, by using CRO proxy, Pagach and Warr (2011) collected data from 138 listed company in the US from Compustat and found that a larger size, higher earnings volatility and more institutional ownership are the characteristics of firms that hire a CRO.

There has also been an ERM and determinant study outside the United States, which used CRO proxy to measure ERM companies. This was carried out by Golshan and Rasid (2012) and was based on 90 Malaysia companies. It proposed that leverage is a significant factor associated with the extent of ERM implementation. Meanwhile, Beasley et al. (2005) limited their study to 123 organisations and obtained data from internal auditors who were not directly involved in ERM activities. The results suggest that the involvement of CRO, CEO, CFO and board independence were related to ERM implementation. A larger firm size and the high reputation of the firm, from the presence of Big Four auditor, were also important characteristics of organisations that implement ERM.

Based on previous literature, the characteristics previously considered are shown below, with their proposed relationship to ERM implementation.

The Firm's Size. Larger companies seem to face more uncertainty and complexity in their business operations, and as a result need to implement an effective risk management system (Gatzert and Martin, 2015). Previous studies suggested there is a positive correlation between a firm's size and their engagement in ERM activities (Beasley et al., 2005, Razali et al., 2011, Hoyt and Liebenberg, 2011, Pagach and Warr, 2011). While Liebenberg and Hoyt (2003) found that size has a negative relationship.

Leverage. Leverage affects the capital structure of a company and excessive debt can increase the chance of bankruptcy and has the potential to cause financial distress. Hence greater leverage is implied to be a greater default risk (Hoyt and Liebenberg, 2011). Therefore, firms with high leverage should manage the risk to an acceptable level in order to avoid debt default and financial difficulty. Leverage, though, may not be directly related to ERM (Hoyt and Liebenberg, 2011). Financial leverage was also found to have a positive effect on the implementation of ERM (e.g. Liebenberg and Hoyt, 2003, Golshan and Rasid, 2012).

Reputation. Firms are more aware of the need to ensure transparency and good governance to establish their reputation (Yatim, 2009). Reputation is a valuable asset for a company that should be maintained and can be affected by the stakeholders' perception of risk management (Markham, 1972).

Growth. According to Pagach and Warr (2011), firms with a higher growth option generally have a higher cost of financing because of the uncertainty of the payoff and higher possibility of bankruptcy. Firms with high growth might face a higher degree of uncertainty due to the pressure to achieve future returns and, as a result, take risky actions to achieve their business objectives (Liebenberg and Hoyt, 2003).

Technology Change. The rapid development of technology requires effective risk management (Rasmussen, 1997, Raz et al., 2002) and it is critical to have successful information technology (IT) protection (Stoneburner et al., 2002). Technology progress contributes to both a reduction in negative risk exposure and unexpected low returns (Kim and Chavas, 2003).

Market Uncertainty/Earning Volatility. Liebenberg and Hoyt (2003) mentioned that one of the general benefits of ERM is a reduction in the company's volatility. Uncertainties, such as the general environment, industry and firm-specifics, may cause unpredictability in a firm's overall performance (Miller, 1992). Both Liebenberg and Hoyt (2003) and Hoyt and Liebenberg (2011) hypothesised the relationship between ERM implementation and the volatility of earnings, but both studies showed insignificant results. Kren (1992) and Gordon et al. (2009) separated the uncertainty in the organisation into a variation of sales (market uncertainty) and a

variation of earnings (earning volatility). Higher market uncertainty and earning volatility can have a negative effect on ERM implementation.

Economic Factor/Gross Domestic Product by Sector. Erb et al. (1996) found that economic growth is significantly related to expected returns and the fundamental valuation of the firm. In previous studies, GDP was usually taken as a proxy when cross-sectional studies were performed. Within one country, different sectors can provide different sector GPD, which might influence growth opportunity within the specific sector. A higher GPD by sector might relate to a firm having a greater need for more effective ERM due to it having better resources, greater competition and more opportunity than the other firms.

2.9 Conclusion

ERM has been advocated as an approach to tackle risk management within companies by both regulators and international bodies. The main issue, though, seems to be implementation. There are a number of conflicting guidelines about ERM, which means that implementation is not an easy process for an organisation. The lack of a unified definition of an ERM framework, description inconsistency and a limitation in effectively measuring the level of ERM implementation provides daunting challenges to those who are conducting empirical research on risk management.

This chapter has reviewed and proposed a unified ERM definition and an integration of various ERM definitions based on past literature. The components of effective ERM were gathered and proposed, based on various frameworks and previous literature. Moreover, as with previous ERM studies, it can be concluded that these have not been of sufficient quality to be conclusive about the nature of the relationship between ERM implementation and behaviour, e.g. firm performance and the determinant of ERM.

Therefore, this study aims to propose an integrated ERM Scoring method where the contribution measurement can be standardised. It also plans to identify how ERM contributes to the firm performance, as well as find the determinant of ERM

implementation. The components of effective ERM will be used to measure the ERM Scoring method, which involves well-organised risk governance, evidence of the existing ERM program, responsibility and accountability, as well as the process of risk management to identify, measure, manage and disclose all key risks that are relevance to staff across all levels of a firm. This study will quantify ERM and fill the literature gap.

Chapter Three

Methodology

3.1 Introduction

This chapter presents the research strategy and methodology that is used in this study. It addresses the research setting and the construction of a measurement scale, data collection, data processing and analysis methods. This chapter provides a descriptive understanding of the research process throughout this thesis. The literature review in Chapter Two showed the limitations in ERM studies. The major aspects in ERM studies are:

1. The various ERM definitions and frameworks that have led to different ERM practices. Previous studies have failed to integrate these different ERM definitions and frameworks so that a set of reliable ERM components can be developed. Based on the proposed current framework, the aims of the current study are to identify best practice in ERM implementation.
2. Whilst previous research has attempted to study the impact of ERM and the relationship between ERM and firm performance, so far they have failed to reach a consensus on the contribution of ERM to company performance. This is due to a lack of a reliable ERM measurement.
3. With the development of a reliable measure of ERM implementation, it would be possible to provide a more definitive statement about the impact and contribution of ERM to company performance.
4. There are still questions about what the determinants are of effective ERM implementation. The lack of clear empirical evidence of what firm-specific characteristics influence ERM implementation may inhibit the effectiveness of its implementation, and therefore the empirical research will be focused on this context.
5. There is no previous study on ERM implementation in Thailand's Listed Companies.

By understanding the gaps in the literature, this study aims to both deal with these issues and advance research in the area of ERM. Therefore, the aims and objectives of the research are as follow:

1. To review the various definitions and frameworks of ERM accord in relation to developing an understanding of the key features of ERM implementation within listed companies.
2. To develop an approach to measure ERM implementation. Within this objective there are two sub-objectives:
 - To ensure the proposed method reliably compares with the alternative statistical method.
 - To explore whether the proposed method performs well compared to the alternative models, by exploring its performance in predicting firm performance along with control variables.
3. To explore the current stage of ERM implementation in Thailand's Listed Companies.
4. To examine whether the implementation of ERM increases financial performance.
5. To explore which of a firm's characteristics influence the level of ERM implementation.

The chapter divides into the 11 sections. Section 3.2 - 3.3 begins by providing an overview of the research approach, research setting and rationale of choosing the sample. Section 3.4 - 3.7 then moves to the sample selection process, the methodology to collect the ERM variable and data collection of other variables. Section 3.8 reviews the variable of ERM and Firm Performance and the variable of determinant of ERM implementation. In section 3.9 - 3.10, both the data processing involved in the data treatment and data process are described. Finally, in section 3.11, the chapter ends with a conclusion.

3.2 Research Methodology

This research carefully considered the research design from the boarder perspective of the epistemological position, research strategy and research method that is employed throughout this study. All of these elements will be developed in this section.

3.2.1 Research Philosophy

When we start to look at the nature of research, it is important to explain the differences between the nature of knowledge creation and epistemology (Crossan, 2003). *“Epistemology is concerned with ways of knowing and learning about the social world and focuses on questions such as: how can we know about reality and what is the basis of our knowledge (Ritchie et al., 2013).”* The researcher should be careful when choosing their philosophical research strategy because this can influence the way the research process is performed in order to obtain the answers to the research question (Flowers, 2009). McEvoy and Richards (2006) mention that there are three main epistemological positions used in social research. These are:

1. Positivism: reality is external, objective and independent of social actors. This philosophy is the most widely used philosophy in research (Mackenzie and Knipe, 2006), which suggests using the methods of the physical and natural sciences in the research of social reality. The methods (e.g. hypothesis testing and model) can provide reliable data to explain social phenomena (Ritchie et al., 2013). In doing so, this philosophy advocates the use of quantitative methods by using statistical data (Cherryholmes, 1992). This method is used to develop law-like generalisations.
2. Interpretivism: reality is subjective, in contrast to positivism. It is socially constructed and the difference between people should be respected. Knowledge is subjective and focuses on the details of a situation and the reality behind these details, with subjective meanings and motivating actions.
3. Realism: reality is objective. It exists independently of human thoughts and beliefs. However, realism can also depend on social conditioning and subjective observation. Bhaskar (2010) argues that in order to understand reality, a researcher is

required to realise the social structures that have given rise to the phenomena under analysis. Therefore, this paradigm concerns both positivism and interpretivism.

In this research, the main objective is to construct a reliable ERM measurement model that can be standardised. The proposed method should be validated by comparing it with different multivariate statistical techniques to reach an end result. This ERM measurement is used to examine the relationship between ERM and performance with verifiable data collection and analysis through the scientific method. Therefore, positivism is an appropriate epistemological stance to use as the framework to conduct this research.

3.2.2 Quantitative Research Strategy

Research strategy can generally be divided between quantitative and qualitative research (Neuman, 2006). The quantitative research approach is usually based on positivism and the qualitative research approach is often underpinned by interpretivism. Table 3.1 summarises the different characteristics of both the quantitative and qualitative paradigms.

Table 3.1. Characteristics of both quantitative and qualitative paradigms

Characteristics	Qualitative approach	Quantitative approach
Objective	Concerned with understanding participants' behaviour from the frame of reference	Seeks the facts or causes of social phenomena, without advocating subjective interpretation
Approach	Phenomenological approach	Logical, scientific approach
Measurement	Uncontrolled, observational data	Obtrusive, controlled measurement
Researcher position	Subjective, insider's perspective, close to the data, includes the points of view of participants	Objective, outsider's perspective, distanced from the data, includes points of view of the researcher
Method	Inductive, exploratory, expansionist, descriptive, discovery orientated, structured, generation of theory	Deductive, ungrounded, verification oriented, confirmatory, reductionist, inferential, unstructured
Epistemological orientation	Interpretive	Natural science model, in particular positivism
Orientation	Process oriented	Outcome oriented
Evaluation	Validity is critical: rich, real and deep data	Reliability is critical: real, hard and replicable data
Scope	Holistic: attempts to synthesise	Particularistic: attempts to analyse
Assumption	Assumes a dynamic reality	Assumes a stable reality

Source: Adapted from Salazar (2010), Cook and Reichardt (1979), Bryman (2012) and Cook and Reichardt (1979)

In contrast to qualitative research, Burns and Bush (2003) state that “*quantitative research is defined as research involving the use of structured questions in which the response options have been predetermined and a large number of respondents are involved*”. This approach is a formal, objective and systematic approach achieved by collecting sizeable numerical data that is analysed by using mathematically-based methods (models, theories and hypothesis) to obtain the results of the study, e.g. to describe variables, examine the relationships amongst these variables and determine the cause-and-effect interactions between variables (Blaikie, 2003). The main emphasis of the quantitative method can be used in systematic investigations of data quantification to explain a deductive approach. This works from the more general theory to the more specific hypothesis, with specific data that can be tested, and the researcher then brings their work down to a conclusion. This is called the “top-down” approach (Bryman, 2012). In this study, the quantitative research strategy would take the lead to tackle a research problem.

Led by the positivism paradigm under deductive reasoning, the quantitative research is taken to address all of the research questions in this study. The research problems in this study require a systematically analytical model for constructing reliable ERM measurement, which will examine whether the implementation of ERM increases financial performance and also explore which firm characteristics influence the level of ERM implementation.

3.2.3 Research Method

The quantitative method involves the analysis of ERM implementation data obtained from the data collection procedures through a survey questionnaire instrument. Given the lack of explicit externally disclosure of ERM activities, a questionnaire-based survey is constructed to the appropriate questions from a set of key ERM components. Then the questionnaires are used to collect ERM implementation data from potential respondents. The self-completion questionnaires approach is chosen as an efficient way to get large amounts of data in a period of time. Other variables are collected from a secondary database. The analysis of the data is conducted by

using statistical technique to draw conclusions about the findings. Overall, the research approach in this study is as follows:

The early phase of this research is to gather the ERM components from various definitions and frameworks. As there is a lack of a list of key components of ERM implementation, the study identifies the major components of ERM by reviewing the literature, definitions and guidelines of ERM, along with their measurement.

To demonstrate the approaches viability, the ERM survey questionnaires have been constructed and the data collected from publicly-listed firms in Thailand. Statistical analysis is used to test the reliability and validity of the data, as well as interpret the responses to the survey questionnaires.

The third phase, after a measure of ERM implementation is proposed, integrates the ERM components that are recorded in the survey. This measure is then compared to three alternative approaches. These are cluster analysis, principal components analysis (PCA) and partial least square analysis (PLS). Various statistical techniques are used to ensure that the proposed method is reliable, compared to the alternative method.

The next phase, called stepwise regression, is used to test the hypotheses and get the statistical results of the empirical investigation of the relationship between ERM and company performance. The model is considered by taking into account appropriate control variables. Finally, a set of proposed relationship between ERM implementation and firm-specified characteristic are considered in the ordinal regression model.

3.3 The Research Setting

The global economic downturn continues, especially in the US and European countries. In Southeast Asia, it is appreciated that there is a need for the ten members of ASEAN (Association of Southeast Asian Nations) to form a single market and production base. This will come into force when the ASEAN Economic Community (AEC) commences in 31 December 2015. ASEAN, established in 1967, is a large economic community in South East Asia that comprises of 10 countries – Brunei

Darussalam, Cambodia, Indonesia, Lao People's Democratic Republic, Malaysia, Myanmar, Philippines, Singapore, Thailand and Vietnam, which has a combined population of over 600 million and had a GDP of USD 2.3 trillion in 2012. Their GDP accounts for 3% of the world's total. ASEAN is the 3rd pillar of growth in Asia, following China and India, with an average GDP growth over the past 15 years of around 6% p.a. ASEAN growth was very robust over two decades, despite the Asian financial crisis in 1997-1998 and the global financial crisis in 2008-2009. Moreover, the IMF expects that the annual real GDP growth of ASEAN will be around 6%. Figure 3.1 show ASEAN's GDP by country in 2012 (Source from IMF and DB research website, 2013).

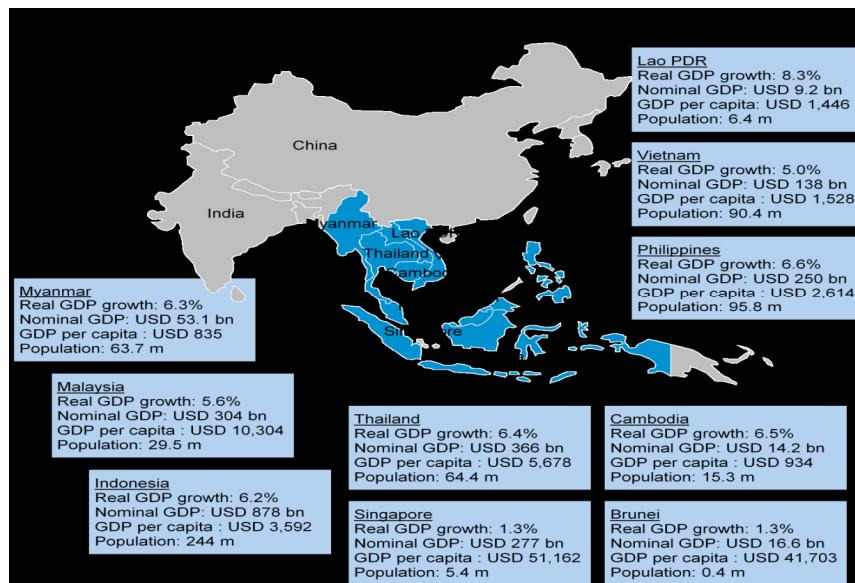


Figure 3.1 ASEAN's GDP by country

From the implementation of AEC, the ASEAN Exchange, a collaboration of the seven stock exchange of ASEAN⁴, was established and launched as a cross-border electronic trading platform called the ASEAN trading link. Since 15 October 2012, three countries, Singapore, Thailand and Malaysia, were the first to join this electronic platform connecting Bursa Malaysia, the Singapore Exchange and The Stock Exchange of Thailand. The system allows brokers from the three exchanges to

⁴ These are the Singapore Exchange, Bursa Malaysia, Hanoi Stock Exchange, Ho Chi Minh Stock Exchange, Indonesia Stock Exchange, The Philippine Stock Exchange and The Stock Exchange of Thailand.

connect their clients to trading in the exchanges of the other countries. An exemption from capital gains taxes when shares are bought by using the ASEAN Trading link enhances the opportunity of investors to invest in these three markets. In this trading platform, the emerging countries Thailand and Malaysia have had significant growth opportunities with GDP growth being around 6%, while Singapore, which is classified as a developing country, has GDP growth of around 1.3%.

To increase current understanding of ERM in the emerging market of the South East Asian Listed Companies, Thailand was chosen to be the initial target of this study of risk management practice and the testing of ERM measurements. A rationale for this is that listed companies in the emerging market need to provide reasonable assurance of their ability to achieve their objectives by being well-prepared for adverse events or losses that can result from both internal and external factors. This is needed in order to persuade a flow of funds from investors. Ernst & Young and The Institute of Internal Auditor Malaysia carried out a 2011 survey on risk management practices to gain insight into risk management practice in Malaysia. There is currently no similar survey on risk management practices in Thailand.

According to Paiboon Nalinthangkurn, Chairman of the Federation of Thai Capital Market Organizations (FETCO) in Thailand, the competitiveness report of 2012 stated that:

“The Thai capital market has been upgraded from the Secondary Emerging Market to the Advanced Emerging Market status by Financial Times Stock Exchange (FTSE) since March 2012. Thailand’s Corporate Governance Ranking has increased from the 8th in Asia to the 4th in 2010, according to the Asian Corporate Governance Association (ACGA). Moreover, the dividend yield is among the highest in Asia. 75% of SET100 companies have consistently paid out dividends during the past three years. Therefore, we believe in significant growth, integrity and prosperity of the Thai capital market.”

Thailand was chosen because of accessibility to the required data. There is also the current need for listed companies in Thailand to provide reassurance about their management of risk, as a result of the emergence of the ASEAN Economic Community (AEC), an economic trading block of ASEAN countries. Hence, the

companies listed on the Stock Exchange of Thailand provide an ideal study of ERM implementation.

3.4 Target Population

This study conducted a survey analysis by sending a questionnaire to all of the 518 Thai listed companies on the Stock Exchange of Thailand (SET). The sample used for this study was derived from the SET website on 31.3.2013. Only one year's worth of data is needed to understand the stage of ERM in Thai Listed Companies, since it is assumed that both corporate governance and the risk management structure are normally stable and do not change very rapidly over a short period (Black et al., 2006, Tahir and Razali, 2011).

This research targeted the whole population, covering Thai companies from various industries or sectors, with different natures, sizes and operations. This allowed an understanding of the current state of risk management amongst the Thai Listed Companies. Table 3.2 classifies the Thai listed companies by their corresponding industries.

Table 3.2 Thai Listed Companies by industry group

Industry Group	Total
Agro & Food Industry	41
Consumer Products	39
Financials	57
Industrials	80
Property & Construction	125
Resources	28
Services	89
Technology	38
Companies Under Rehabilitation	21
Total Population of Companies	518

Previous literature that related to the ERM and firm performance typically provided empirical evidence by using a sample from a certain industry (Gordon et al., 2009), and the banking and insurance industry is the most frequently observed sector in ERM and firm value literature (Kraus and Lehner, 2012). For example, Hoyt and Liebenberg (2011) used 117 U.S insurers to show ERM's relation to firm value.

Eckles et al. (2014) used a sample of 69 publicly trading insurance companies in the US to show that practicing ERM reduces the firms' costs by reducing their risks and lowering the marginal cost (MC) of reducing risk. Pooser (2012) used a sample of S&P's ERM quality rating for insurers in property-casualty firms to find the effectiveness of an ERM program in reducing or preventing shocks to firm performance. This was due to the emergence of new risks and marketplace needs and conditions, as was shown by S&P (2008) expanding the methodology of review ERM for both cooperate entities and insurers. ERM is expected to be implemented in both the financial and non-financial sectors (Lajili and Zeghal, 2005). Therefore, it is essential to understand the relationship between ERM and firm performance in both financial and non-financial companies.

Property fund and companies under rehabilitation were not included in the sample due to different performance measurements and the lack of financial data in companies under rehabilitation, as there are different accounting standards and rules practiced by these funds. Instead of earning per share from profit to the number of total shares that can be calculated in general listed firms, property fund's performance is calculated from the net asset value (NAV) of the company's total assets, minus its total liabilities to the number of shares. Therefore, after excluding these property funds, the final firms being studied consisted of 456 Thai Public Listed companies.

3.5 Target Respondents

As this research aims to find an appropriate ERM measurement method and recognise the current state of risk management in Thailand, it is necessary to get a response from the person who is in a position to understand the overall process of risk management within a company. In 2012, the Institute of Internal Auditors' Vice President of North American Services, Hal Garyn, said in 'Who's responsible for risk?' that: *"Risk managers and internal auditors have many of the same stakeholders – boards and executive management – and these stakeholders want to maximise resources while effectively managing risk."* In addition, risk management is an internal process throughout a firm and is confidential. Therefore, this

questionnaire might need the approval of a top management position (CEO) that has authority in decision making in order to allocate a responsible person to answer the questionnaire.

As a result, the survey questionnaires were distributed by post to all CEOs in Thai Listed companies. The attached letter asked the firm to pass the questionnaire on to the person responsible for risk management responsible in the company, who might be Chief Risk Officer (CRO), Chief Financial Officer (CFO), Chief Internal Offer (CIO), Risk Management Committee, Audit Committee or Senior Risk Management position, depending on the position's name and organisation's structure, which can vary in different companies. For example, some listed companies, mostly financial ones, set up a risk management department and have a CRO position or risk management manager. Whilst other listed non-financial companies have the risk management function under the CFO in accounting and financial department or the CAE in the internal audit and internal control department.

3.6 ERM Data Collection

The questionnaire for this study was distributed to all Thai listed companies through three methods – mailing, online survey and fax.

These were prepared in both English and the Thai languages. The questionnaire was first developed in English and then translated into Thai, the native language of the respondents. In order to avoid translation errors, the questionnaire was translated back to English to ensure measurement equivalence of the instrument.

In the initial step of data collection, the Thai surveys were printed and sent by mail to all the Thai listed companies. The deadline for sending them back was mentioned in the cover letter attached. To gain effective ERM, it should start as a top-down process and create the tone of the tops from the CEO and management team to establish the risk management structure (Dickinson, 2001). Therefore, this survey was sent to the CEO of each firm in order to increase credibility of this study. The respondents were requested to complete the questionnaire and send it back using the stamped addressed envelopes. The other data collection method utilised by this study

was an online survey, which was a questionnaire that can could be filled in and returned electronically on a survey software tool website. Respondents were notified of the availability of this online survey via the cover letter enclosed in the mailed questionnaire.

The questionnaire was followed up three weeks after it was mailed and phone calls made to each of the firms to not only ensure that the survey was successfully received and reached the right respondent, but also the questionnaire was being processed by the responsible person. If respondents did not receive the mailed questionnaire, they were given options to request a second copy of the questionnaire, which could be sent via registered mail, fax or email, where the online survey link and electronic-fill in questionnaire form was attached to the message. The electronic questionnaire form was created as a PDF file that allowed respondents to fill in the questionnaire form and return it by email.

Respondents had options to return the questionnaires in different ways, either by mail, filling in the online survey, sending it back by fax or attaching it to an email. They could choose whichever method was convenient for them.

To increase the response rate for this study, the email was sent to 453 graduated students who studied a Masters degree in accounting from Thammasat University, who generally worked as an internal auditor, external auditor or head of accounting department in listed companies. The email invitation was sent directly to all the graduates and asked for their help in contacting the head of risk, who was the responsible person in their companies. The email and contact name was provided, so that the email invitation was sent directly to respondents with the online survey link attached.

Some respondents were gained from limited companies, subsidiary companies of listed companies and public companies that are not listed on The Stock Exchange of Thailand (SET). In total, 19 non-listed companies responded to the questionnaires.

The survey administration took approximately five months. In total, 133 survey responses, including 114 responses from Listed Companies, were collected and there were an extra 19 survey responses from respondents in Limited Companies in

Thailand received. This represented a response rate from Listed Companies of about 25%.

In the initial step of the survey, all of the 133 usable responses from the Thai Listed Companies and its subsidiary companies were collected for survey analysis in Thailand to understand the current stage of risk management in the country. Whilst the initial intention was to cover all responses and in order to better understand the overall risk management practice in Thailand, the analysis was subsequently restricted to the surveys that were completed. This meant reducing the number of responses that were used, including limited companies, property funds, non-disclosure listed companies' name, substantial incomplete responses and an extreme outlier, based on their financial performance. The final number of responses employed was 87 Listed Companies, or 19 percent of the total listed companies. Obviously, it is important to test whether there is a selection bias. This will be tested and discussed in the following section.

3.6.1 Questionnaire ERM Performance Design

A questionnaire is a formalised set of questions that enables researchers to gain an understanding of the respondents (Malhotra, 2008). There are two main purposes of questionnaires. These are to understand the current state of ERM and to derive an aggregate ERM measurement. This research used generic control and risk management measures, which have the benefit of reflecting the firm's own assessment of risk management practice in each company. From the data supplied by each company a picture of current ERM practice was provided, as well as the issues in Thailand, for an audience of academics and practitioners in the field.

The ERM measurement components and questions will be fully presented in the next chapter. Overall, the questionnaire can be divided into two main categories. Firstly, a set of question that were designed for the measurement of ERM. The design of the ERM questions that measured ERM implementation were based on 6 aspects of the ERM risk management process that were considered, and came from the COSO-ERM framework (2004) and other ERM implementation components.

Secondly, another set of questions was based on relevant academic literature to gain a more informative sight into ERM adoption, the choice of risk management structure, risk management standards, techniques and effectiveness. As a consequence, some of the questions were not intended to be used for the construction of the measurements. They did, however, provide a greater understanding of the current state of ERM practice. After the initial design phase of the questionnaire, a group of specialists reviewed the list of questions that were considered relevant to increasing our understanding of the current stage of ERM.

Dillman (2011) recommended that it is important to conduct a pre-test before sending a survey to respondents in order to make sure the wording was understandable, terminologies and scaling, the relevancy and structure of the questions, the relevance of the questionnaires and the length of time it took to complete all the questions. Moreover, the pre-test was performed in order to ensure that the design and conception of the questionnaire were both meaningful to respondents. The questionnaire was designed to collect information about the current practice of ERM in listed companies. Therefore, a pre-test amongst 5 risk management managers or risk management committees was conducted and revision performed to confirm the completion of the questionnaire. They could also provide additional comments and suggestions about questions on the questionnaire. All aspects of the questionnaire were tested, including the question content, instructions, clarity, wording, timing and sequence. Minor changes were made to improve the questions when necessary in order to make them easy to understand. The final list was composed, including the nominal and ordinal measurements. Appendix B shows the ERM research questionnaire used in this study.

3.6.2 The Questionnaire's Design and Layout

The final version of the questionnaire was divided into 4 main parts, including a section of Introductory Questions, Questionnaire of ERM Performance Index, Respondent Background and Other Comments and Feedback. This length of survey covered 40 essential components from previous literatures in order to assess the ERM implementation level and gain a better knowledge of current ERM practice in

each organisation from the holistic insider's point of view, and to measure the ERM of each firm.

The research was wary of a providing too many questions as there is the possibility of respondent fatigue if a questionnaire is too long (Bryman, 2012). This research subsequently provided the survey results to those who participated in the study by giving them an email address at the end of questionnaire. The respondents will benefit from the research results because they were asked to provide a recommendation on best practice to improve risk management. Moreover, the covering letter gave an approximate time to complete the questionnaire, which took between fifteen to twenty minutes, and respondents were able to read the whole questionnaire before answering the first question.

To enhance the response rate, the researcher adopted the technique of Mangione (1995), including designing a clear layout and cover letter after collaborating with two distinguished universities – Thammasat University (Thailand) and the University of Edinburgh (United Kingdom). The questionnaire's design had a clear layout, readable font and as simple a structure as possible. Ambiguous wording and terminologies were avoided, so that it could be clearly understood by the respondents, who were required to mark the most appropriate answer about themselves and their firms in the space provided.

The questionnaire was accompanied by a cover letter that contained a statement, which introduced the objective of the study, the structure of the questionnaire, the contact details of the researcher and the deadline. Moreover, the statement assured the respondents that their responses would be treated confidentially, in line with the Ethical standards of the University of Edinburgh. No third party will have access to each individual response and the respondent had the option not to disclose their name and the firm they were working for.

3.7 Data Collection of Other Variables

The data sources for this study came from both primary and secondary data, with different databases that analyse and store financial and independent variables. ERM

variables were gathered from the primary source by the survey of all the listed companies in Thailand.

The main sources for other independent and dependent variables were information pertaining to firm performance variables and determinants that were obtained from online access to information about the listed companies in Thailand, called SET Market Analysis and Reporting Tool (SETSAMRT⁵), and the company's annual reports and DataStream databases. SETSMART generally includes company profiles, financial performances, quarterly financial statements, daily trading information, announcements and news from all the Thai listed companies. In addition to submitting the annual report to the Department of Business Development, Ministry of Commerce, all of the listed companies in Thailand have to submit their annual report and additional data to the Stock Exchange of Thailand (SET). The data is digital and available by subscription from the SET database. This contains data from the past 5 years and this proved adequate for this study. If no information was available from SETSMART, then DataStream was used as an alternative source.

⁵ SETSMART (SET Market Analysis and Reporting Tool) is the web-based application from the Stock Exchange of Thailand that can seamlessly integrate comprehensive sources of Thai listed company data, i.e. historical stock prices, historical indices, listed company profile and historical news.

3.8 Research Variables and Models

3.8.1 ERM and Firm Performance Variables and Models

The conceptual model for the study is presented in Figure 3.2 below.

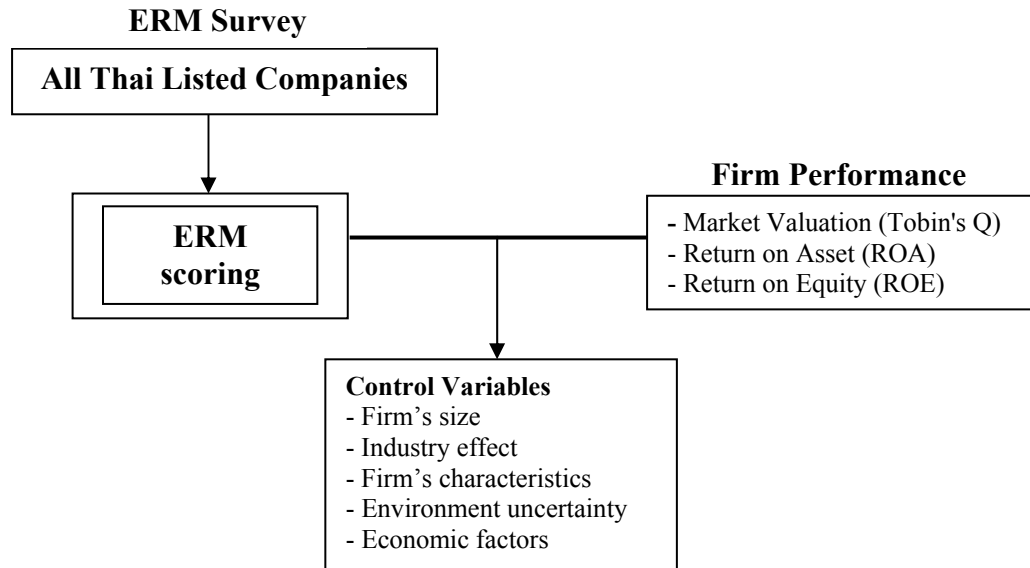


Figure 3.2 Conceptual model linkages between ERM and firm performance

The assumption is that firm performance can be expressed as:

$$Firm\ Performance = f(ERM\ Scoring + control\ variables)$$

The initial assumption will be that 'f' is a linear form that can be fitted by using OLS regression. In order to reduce multicollinearity, stepwise regression will be used for the empirical study.

3.8.1.1 Selection of Financial Performance Variables

Most research into ERM and firm performance uses a single indicator of the firm's value. The majority have used Tobin's Q as a measure of the firm's value (Hoyt and Liebenberg, 2011, McShane et al., 2011, Tahir and Razali, 2011, Gatzert and Martin, 2015), but other measures have been used, such as excess stock market return (Gordon et al., 2009), cost and revenue efficiency (Grace et al., 2015). Richard et al. (2009) carried out a study that measured organisational performance as a dependent

variable towards methodological best practice in business fields. They suggested that a single dimension of performance measurement might limit the effectiveness of the commonly accepted measurement practices.

In this research, there were three alternative measurements of firm performance that concerned both performance measurements. These were based on financial market criteria (Tobin's Q), and financial performance, which was based on accounting measurements (Return on assets, ROA, and Return on Equity, ROE), as our firm value measurement.

Market Valuation (Tobin's Q): Tobin's Q is one of the generally used performance measures. It is the ratio of the market value of a firm's assets to the replacement value of its assets. Gompers et al. (2003) and Bebchuk et al. (2009) show that firms with stronger stockholder rights have a higher Tobin's Q, the proxy for firm value, which suggests that the better ERM firms have more values. Tobin's Q is the most commonly used measurement of firm value in empirical risk management studies (McShane et al., 2011, Gatzert and Martin, 2015). It can calculate the market value of equity, plus the book value of liabilities divided by the book value of assets.

Typically, Tobin's Q is a performance measurement in the mean of investment opportunity. When the value of Tobin's Q is more than one, it implies that the market value of a firm's assets exceeds its replacement costs. There are premiums over the value of the company's asset that an investor is willing to pay extra and there is an expectation of prosperity by the current management.

The advantage of using Tobin's Q as a performance measure is that it is less subject to management manipulation because of the market value of equity is used instead of earning. Moreover, Tobin's Q concerns market value and the replacement cost of firms, which is a forward-looking measurement of a firm's value. However, the problem of using it is that, in order for Tobin's Q to be truthful, an accurate measurement of both the market value and replacement costs are required. However, the market value of firms in emerging markets might not reflect the true value of a company because of market sentiment, reflections, speculation or rumours. In

addition, there are difficulties in both measuring intangible assets and adjusting to changes in the replacement costs. This might be the problem of using Tobin's Q.

Accounting Valuation (ROA and ROE): Accounting measurements are the most common and generally used method of measuring organisational performance (Richard et al., 2009). There is extensive evidence of their usage validity, which shows the relationship between accounting and economic returns (e.g. Danielson and Press, 2003). For a multi-dimensional firm performance, the very popular accounting measurements of performance ROA and ROE were both used.

ROA: is an indicator of how profitable a company is relative to its total assets. It can calculate the ratio of net operating profit to the firm's assets. ROA measures firm performance in terms of its profitability prior to the effects of financing. By taking the financing effects away from the operating effects, ROA provides a straightforward measurement of the true profitability of these assets. ROA measurements provide a better understanding of how well a firm uses its assets to generate income. However, there needs to be some caution when using ROA as a performance measurement because the figures for the total assets of the company use the book value of the assets. This book value may not correspond to the actual market value. In addition, earning value in the profit and losses statement can be potentially manipulated by management. Thus, ROA might not be an absolute measurement of a firm's performance and should be combined with other performance measurements.

ROE: is an indicator of how profitable a company is relative to its equity, and is a measurement of how much the firm generates profits as a company is relative to its ownership interest. It can be calculated as a ratio of the net operating profit to the Shareholder's Equity. ROE measurement provides a better understanding of how well a firm uses every unit of shareholders' equity to efficiently use its income. ROE also indicates how well a firm uses the investment fund to generate earning growth. It points towards a useful signal of financial success with the growth in profits of the remaining equity capital into the business. However, an ROE measurement has the same financial manipulation problem as ROA. So it might better to combine

accounting measurement with a market performance measurement to help improve understanding.

Therefore, ROE and ROA can be regarded as the second and third measurements of firm performance.

3.8.1.2 Selection of Control Variables

Based on the extensive literature available, the research investigated other control factors that may affect the relationship between ERM performance and firm performance. These factors could influence the firm's value. The rationale underlying each factor is developed below.

Firm Size (*SIZE*): COSO (2004) point out that the firm's size is important to ERM implementation. It has been a primary consideration in organisation theory (Lawrence et al., 1967); accounting and governance studies (Core et al., 1999, Gillan and Starks, 2003, Bhagat and Bolton, 2008). The relationship between the firm's size and performance has been commonly used in ERM studies (Liebenberg and Hoyt, 2003, Beasley et al., 2008, Gordon et al., 2009, Grace et al., 2015, Hoyt and Liebenberg, 2011, McShane et al., 2011, Lin et al., 2012). Most of the previous studies found the adoption of an ERM system positively related to the firm's size (Hoyt and Liebenberg, 2011, Beasley et al., 2008, Lin et al., 2012). Larger firms have the potential to benefit more from economies of scale but, on the other hand, Gordon et al. (2009) and Cater (2006) found that size has a negative relationship with the firm's value. Thus, it is essential to control the firm's size in this study. The current research follows previous research when applying the natural logarithm of total assets as the size proxy.

Industry Effect: Different industries that companies operate in could have different levels of complexity and value creation. Business complexity can reduce a company's return owing to the excessive expense of handling and monitoring different divisions and sub-units (Bodnar, 1999). It is considered that the more business sectors the company operates in, the greater a firm's complexity (Doyle et al., 2007). While operating in various sectors might create value from synergy and

adaptation (Morck et al., 1998). There were the expected signs that complexity variable is ambiguous and these were related to the firm's value. This research uses the market share of the company over its sector to control the effects of industry (*IND*). It can be expected that a firm with a higher market share will have more competition in its industry and benefit from cost effectiveness. Therefore, the market share variable positively relates to the firm's value. Market share is defined as the firm's sale divided by the total sales of the industry (Gordon et al., 2009).

Firm Leverage: There are relationships between capital structure and firm value. However, the effect of firm leverage variable on ERM implement and firm value is still inconclusive. Hoyt and Liebenberg (2011) mention that greater leverage implies a greater risk of default. Excessive Debt can increase the chance of bankruptcy and it might have the potential to create financial distress costs. On the other hand, there is a positive relationship between financial leverage and the firm's value because firm leverage can reduce the agency cost of free cash flow (Jensen, 1986). This study uses two methods to calculate leverage, which is consistent with Geringer et al. (2000) and Tallman and Li (1996). It can also compute leverage (*LEV1*), as measured by Long Term Debt/(Total Liability + Shareholder Equity). For the sake of being robust, this paper will also consider alternative definitions of leverage (*LEV2*), as suggested by Hoyt and Liebenberg (2011) that are equal to the ratio of the book value of liabilities to the market value of equity. This can also control the characteristics of other firms' with the following variables.

Reputation (*REPUT*): A company's reputation is a valuable asset of the company that should be given financial value or recognised as a 'competitive advantage' (Hall, 1992). A firm's corporate reputation affects the various methods of value creation towards stakeholders' behaviour. For example, employees work longer with a firm that has a good reputation, higher customer satisfaction and customer loyalty (Markham, 1972). In capital structure, corporate reputation can influence the cost and credit of borrowings (Pittman and Fortin, 2004). The relationship between a firm's reputation and firm performance has a correlation with higher overall returns (Roberts and Dowling, 1997, Vergin and Qoronfleh, 1998). Therefore, this paper is a

control for the effect of reputation. It can be used as a company ages and as a proxy of reputation, which is the number of years since the firm's incorporation.

Sales Growth (*GROWTH*): Firms that face more growth opportunities might be distracted from ERM attempts, according to Hoyt and Liebenberg (2011) and (Pagach and Warr, 2010). Sale growth provides opportunities for economies of scale, learning curve benefits and creating opportunities for investments as a whole to enhance the financial performance objective (Kaplan and Norton, 1996). Therefore, to control the effect of growth on Tobin's Q, this paper uses historical (1-year) sale growth as a proxy for growth opportunity, and so follows Hoyt and Liebenberg (2011).

Environment Uncertainty: The majority of studies make the link between perceived environment uncertainty and firm performance, e.g. Tymon et al. (1998), Luft and Shields (2003) and Chenhall (2006). The environment uncertainty variable might have a negative impact on firm value because change and unpredictability outside the companies cause complexity in the business operation.

According to Kren (1992) and Gordon et al. (2009), there are three indexes that can be measured, which are: 1) Market (*MARKET*) measured as a coefficient of variation of sales 2) Technological (*TECH*) measured as a coefficient of variation of the capital expenditure over the previous 5 years and 3) Income (*INCOME*) measured as a coefficient of variation of net income before taxes over the previous 5 years. Gordon et al. (2009) made measurements by applying the natural logarithm of the coefficient of these three factors in combination. This research separates each variable has its own proxies with none of them applying the natural logarithm because this data is missing for the majority of the sample firms.

Economic factor (*ECON*): Macroeconomic is a fundamental concern to all companies and an important independence factor in explaining performance (Hansen and Wernerfelt, 1989). For example, a monetary and fiscal policy has major significance for the firms' cost of capital. The underpinning of macroeconomic can be seen in the way the economy affects each business, which is different in each of the business sectors. Changes in the economy can be recognised in the way that the

demand of goods and services changes and these matter to firm performance. McNamara and Duncan (1995) measured macroeconomics by the percentage change in GDP with return on assets, and found a positive significance here. This research took into account the GDP differences in each sector. Therefore, it can be expected that ERM adoption is related to macroeconomics and measured by the percentage change of domestic production by sector.

3.8.2 Determinants of ERM implementation and models

Similar to the problems of understanding the relationship between ERM and firm performance, most studies of the determinants of ERM implementation have used ERM proxies, rather than attempting to measure implementation directly (e.g. Liebenberg and Hoyt, 2003, Hoyt and Liebenberg, 2011, Pagach and Warr, 2011, Razali et al., 2011, Golshan and Rasid, 2012). Beasley et al. (2005) determined the ERM stages by using secondary data that was obtained from the Institute of Internal Auditors (IIA). To overcome this shortcoming, this study proposed an ERM score to establish the relationship of ERM with firm specified characteristics, as previously discussed in the literature review part.

To explore the influence of the ERM determinant, as addressed in our hypothesis, this study uses the ordinal logistic regression model for the proposed model linkage between the determinant and ERM implementation. The empirical model is as follows:

$$\text{ERM scoring} = f(\text{SIZE}, \text{LEV}, \text{REPUT}, \text{GROWTH}, \text{TECH}, \text{MARKET}, \\ \text{INCOME and ECON})$$

The conceptual model of the determinant of ERM implementation is shown in Figure 3.3

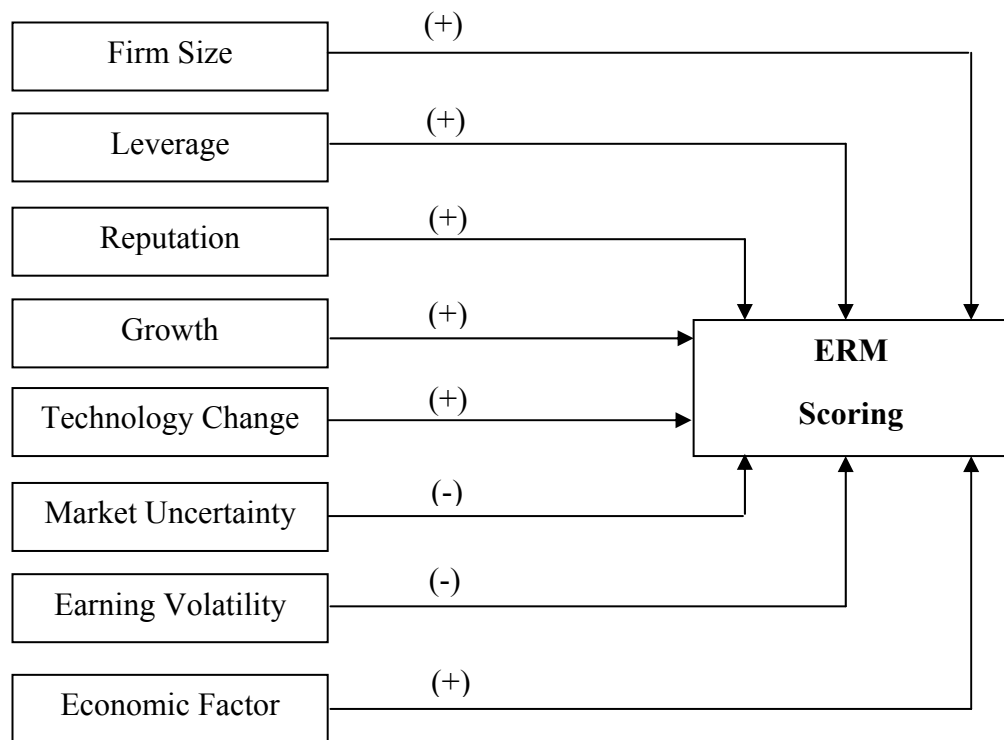


Figure 3.3 ERM determinant framework

3.9 Data Treatment

3.9.1 Preliminary Data Analysis

After data collection was finished, the data was checked for missing value and inconsistent response. All preliminary data that was collected was coded and entered into an SPSS for WINDOWS 19 spreadsheet. The SPSS program was used in a statistical analysis procedure. The data set was then checked through basic descriptive statistics (means, standard deviations and ranges). Values that were out of range or had an improper code could be detected with a simple check (Kline 1998).

Initially, descriptive statistics were used for the purpose of helping to understand the variables and the outline of different variables in the study (Malhotra, 2008). Descriptive statistics, including means, standard error of means, modes, standard deviation, variances, range, minimums, skewness and kurtosis were computed in this study. In addition, charts and histograms were examined to perceive any outliers, to

determine the form of distribution of the means, and to examine whether the observed distribution is consistent with an expected distribution.

Foster (1978) noted that the treatment of outliers is important in financial ratio analysis because many of the ratio applications methodologies used were either univariate or multivariate normality assumptions and parametric test procedures with little being known about the distributional functions of the ratio. There were often extreme data points, departures from normality or outliers when the datasets included some extreme observations that could dominate parameter estimates. Thus, outliers can have a disproportionate influence on the conclusion of the estimate model, so they should be separated or directly removed from the majority of the population to maintain the normal approximation of the data (Orr et al., 1991, Cochran, 1977). An extreme outlier was removed from the sample after careful consideration.

3.9.2 Heckman Correction

To test the selection bias, the Heckman correction (Heckman, 1976, Heckman, 1979) was used in this study. This is based on the Heckman sample selection model, known as the two-stage method or Heckman's lambda. This method statistically corrects for selection bias, which can be considered as a form of omitted variables bias. Sample selection bias may arise because there is a missing data problem during self-selection by the individual or the data sample cannot be the full length of all samples in the analysis. Heckman (1979) stated that:

"In contrast to the usual analysis of "omitted variables" or specification error in econometrics, in the analysis of sample selection bias it is sometimes possible to estimate the variables which when omitted from a regression analysis give rise to the specification error. The estimated values of the omitted variables can be used as regressors so that it is possible to estimate the behavioural functions of interest by simple methods."

To execute Heckman's sample selection model, the analysis can be implemented by using the Stata program.

3.9.3 Reliability

In attempting to produce a score of ERM implementation the multiple-items scales from the ERM 40 components were used. There is an accepted consensus amongst researchers that the scale should be valid with practical utility. The scale must be reliable. The reliability of a scale is defined as *"the degree to which measures are free from error and therefore yield consistent results"* (Peter, 1979), so the reliability of a scale should be consistent with the same attribute (or internal consistency reflect construct of measurement scales. By acclamation (see e.g. Peterson, 1994, Gliem and Gliem, 2003, Tavakol and Dennick, 2011), the most common measure of a reliability coefficient is Cronbach's alpha Cronbach (1951). From the Social Science Citation Index, Cronbach's 1951 article has been referenced in more than 23,000 articles in the last century. Cronbach's alpha is a generalised measure of internal consistency of a multi-items scale. It is formulated as:

$$\alpha = \frac{k}{k-1} \left(1 - \frac{\sum \sigma_i^2}{\sigma_y^2} \right)$$

where k is the number of items in the scale contributing to a total score, σ_i^2 is the variance of item *i* and σ_y^2 is the variance of the scale. The coefficient of correlation has a possible range from 0 to 1.00. The degree of sufficient reliability for the research by Peterson (1994), which compared the reliability levels of many research studies, is shown in Table 3.3. Alpha coefficients should be more than 0.7-0.8 for basic research and more than 0.95 for applied research. The ERM measurement is based on 40 key ERM components from the survey method and the instrument's reliability was assessed using Cronbach's alpha.

Table 3.3 Recommended reliability levels

Author	Situation	Recommended level
Davis (1964)	Prediction for individual	Above 0.75
	Prediction for group of 25-50	Above 0.5
	Prediction for group over 50	Below 0.5
Kaplan and Saccuzzo (1982)	Basic research	0.7-0.8

	Applied research	0.95
Murphy and Davidshofer (1988)	Unacceptable level	Below 0.6
	Low level	0.7
	Moderate to high level	0.8-0.9
Nunnally (1967)	High level	0.9
	Preliminary research	0.5-0.6
	Basic research	0.8
Nunnally (1978)	Applied research	0.9-0.95
	Preliminary research	0.7
	Basic research	0.8
	Applied research	0.9-0.95

Source: (Peterson, 1994)

3.10 Data Analysis of ERM Method

The ERM Scoring method developed was compared with three potential alternative approaches, which are: the Clustering, Principal Component Analysis (PCA) and Partial Least Square (PLS). The methodologies of these models are discussed and reviewed in this section and briefly described below.

3.10.1 Cluster Analysis

Cluster analysis is a multivariate methods of analysis (Krzanowski and Lai, 1988) and it has most frequently been used as a classification tool (Punj and Stewart, 1983). Cluster analysis has been widely used to explore the structure within data (Shih et al., 2010). The definition of cluster analysis is given by Jain and Dubes (1988) mentions that:

“Cluster analysis organizes data by abstracting underlying structure either as a grouping of individuals or as a hierarchy of groups. The representation can then be investigated to see if the data group according to preconceived ideas or to suggest new experiments.”

Cluster analysis is a multivariate procedure for identifying natural clusters of items within data that is based on selected characteristics of items. The clustered formed should be more or less homogeneous groups, so that items in the same cluster are more similar to one another, than they are to items in other clusters (Black et al., 1998). The similarities within clusters and the differences between

clusters are often used to assess whether the clusters are distinct by using an F-test. The advantage of cluster analysis is that it does not make strong assumptions about the form of the data, such as linearity, normality and homoscedasticity, which can cause problems for some statistical techniques. The statistical assumption of cluster analysis requires representativeness of the sample, an absence of multicollinearity among the variables and an absence of outliers when the cluster group is determined (Hair et al., 1998). A general distance function of the similarity measure is the Euclidean distance between two sample points, p_i and p_j , each described by their vectors, $p_i = (F_{i1}, F_{i2}, \dots, F_{iM})$ and $p_j = (F_{j1}, F_{j2}, \dots, F_{jM})$, the distance, d_{ij} , between p_i and p_j is defined as:

$$d_{ij} = \sqrt{\sum_{m=1}^M (F_{im} - F_{jm})^2}$$

In literature, there are two widely well-known traditional clustering algorithms. These are hierarchical and partitioning techniques. Hierarchical clustering repeats find nested clusters either in an agglomerative or partition of the data. Partitioning clustering usually starts with a random partitioning and does not impose a hierarchical structure. The most well-known and the simplest partitioning clustering method is K-means clustering (Jain, 2010).

3.10.1.1 Algorithm of hierarchical clustering

Hierarchical clustering is a general approach that creates clusters with two basis techniques of either an agglomerative or division clustering method by involving a sequential process of clusters:

1. Agglomerative is a bottom up approach that starts with the points of individual clusters at each step, which merge with other clusters that are the most similar, and eventually all the individual clusters belong to only one single cluster.
2. Division is a top up approach that starts with the data set of all points belonging to one cluster, and at each step the cluster breaches into node forms, ending with the n cluster having a cluster of its own.

Agglomerative hierarchical clustering is more common than the division approach (Steinbach et al., 2000). The common algorithms for hierarchical clustering are presented in Table 3.4 with N clusters, each containing a single entity and an $N \times N$ symmetric matrix of similarities $D = \{d_{ik}\}$. The distance between the most similar pair of clusters is U and V be d_{UV} and any other cluster W . Among all of these cluster procedures, the most recognised algorithms for hierarchical algorithms are single linkage and complete linkage (Jain, 2010).

Table 3.4 Common algorithms for hierarchical clustering

Cluster procedure	Description	Formula
Single Linkage, Florek et al. (1951)	Minimal object-to-object distance	$d_{(UV)W} = \min\{d_{UW}, d_{VW}\}$
Complete Linkage, Sorensen (1948).	Maximal object-to-object distance	$d_{(UV)W} = \max\{d_{UW}, d_{VW}\}$
Average Linkage, Sokal and Michener (1958)	Average distance between objects	$d_{(UV)W} = \frac{\sum_i \sum_k d_{ik}}{N_{(UV)}N_W}$
Centroid, Sokal and Michener (1958)	Euclidean distance between their means or the centre of the cluster	$d_{(UV)W} = \ \bar{x}_{uv} - \bar{x}_W\ ^2$
Median, Gower (1967)	Euclidean distance between the middle most or the position average of the cluster	$d_{(UV)W} = \frac{\ \bar{x}_{uv} - \bar{x}_W\ ^2}{2}$
Ward's linkage, Ward (1963)	Minimum-variance within-cluster distances	$d_{(UV)W} = \frac{\ \bar{x}_{uv} - \bar{x}_W\ ^2}{\frac{1}{N_{uv}} + \frac{1}{N_w}}$

Source: (Jain, 2010)

3.10.1.2 Algorithm of K-means Clustering

The k-means clustering method is very simple and the effectiveness of this algorithm is based on non-hierarchical cluster analysis (Liu et al., 2013). Jain (2010) mentions that the origins of the K-means general algorithm are independently proposed in different scientific fields (Steinhaus, 1956, Ball and Hall, 1965, MacQueen, 1967). However, MacQueen (1967) first named it as K-means. Given a required number of k clustering, the K-means clustering algorithm generates new partitioning and assigns a pattern to clusters accordingly in order to

reduce the squared error. This method is based on the concept of centroid that a centre point can represent a cluster by creating an un-nested partitioning of the data points to solve the clustering problem.

The main steps of the K-means algorithm proceeds as follows (Jain and Dubes, 1988):

1. Select a number of k clusters and choose k as the initial estimates of the cluster centroids.
2. Generate a new partition by assigning all points to the closest cluster centroid.
3. Recalculate the new cluster centroid as the new k centroids of each cluster.
4. Repeat steps 2 and 3 until the cluster membership does not change.

The algorithm can be briefly described by assuming that a dataset has m feature (variables) of the i^{th} datapoint (group), where F_{im} is the values of the m^{th} features of the i^{th} datapoint constructed a feature vector of $(F_{i1}, F_{i2}, \dots, F_{im})$. To assign each points to a closed cluster centroid, a common distance metric is Euclidean distances, according to its computational simplicity as presented above as a similarity measure, where p_i and p_j , each described by their vectors, $p_i = (F_{i1}, F_{i2}, \dots, F_{iM})$ and $p_j = (F_{j1}, F_{j2}, \dots, F_{jM})$, the distance, d_{ij} , between p_i and p_j is defined as:

$$d_{ij} = \sqrt{\sum_{m=1}^M (F_{im} - F_{jm})^2}$$

According to a different variable, it has a different relative value and range in order to minimise distortion as the purpose of K-mean. It is essential to find a different variation of each variable within each group, where F_{im}^* is Z-score equation is:

$$F_{im}^* = \frac{F_{im} - \mu_m}{\sigma_m}$$

In order to generate a new partition by assigning all points to the closest cluster centroid, the new mean for the centroids are calculated after all the data points

have been assigned to a cluster where C_{im} represents the centroid of the m^{th} feature of the i^{th} cluster, $F_{i,jm}^*$ is the m^{th} feature value of the j^{th} job assigned to the i^{th} cluster and where n_i is the number of data points in cluster i . Then, the new clustering of centres is that:

$$C_{im} = \frac{\sum_{j=1}^{n_i} F_{i,jm}^*}{n_i}$$

Finally, the algorithm aims at minimising an objective function. The error function used is the sum of the distances between a data point and the cluster's centroid $(F_{i,jm}^* - C_{im})^2$. A squared error function (E_k) is created as follows:

$$E_i = \sum_{j=1}^{n_i} \sum_{m=1}^M (F_{i,jm}^* - C_{im})^2$$

There are some limitations of the K-mean clustering algorithm. This method requires a specific number of K-value before it is analysed. Different initial partitions may lead to different final results for the clusters. Also, the arithmetic mean is not robust to outliers. K-mean does not work well if the result is not a circular cluster (Vora and Oza, 2013, Borah and Ghose, 2009).

3.10.1.3 Algorithm of Two-Step Clustering

These traditional cluster hierarchical and partitional clustering algorithms have their limitations (e.g. Bacher, 2000, Everitt et al., 2001, Huang, 1998, Bacher et al., 2004) because of the problem of commensurability variables that use the sample-based techniques of problem solving. These analyses require a decision from the user to determine the number of clusters in order to calculate through the analysis, which have an influence on the result of the calculation of the classification. But it is still useful to classify groups and is more objective than the subjective group (Dey, 2008).

From the limitation mentioned above, SPSS 11.5 and onward releases issue a two-step clustering analysis procedure. This method can analyse large datasets of both continuous and categorical variables that are to be clustered. This method employs

a probabilistic model where the distance between each cluster is equivalent to a decrease in the log-likelihood function (Okazaki, 2006). In particular, it is the only clustering method that mixes types of variable that can be analysed and the number of clusters can be automatically determined (Bacher et al., 2004, Borah and Ghose, 2009). Two-Step Clustering uses two main steps, which are as follows:

The first step used is to find an initial estimate for the number of clusters. Sample data are assigned into a group of pre-clusters that are then put in place of the single case in the hierarchical algorithm in the second step. Regarding the similarity of pre-clusters, each consecutive case is used to form a new pre-cluster by using a likelihood distance measurement based on the similarity criterion.

In the second step, a group of pre-clusters from the first step can be divided into the desired number of clusters by using the agglomerative hierarchical clustering algorithm. This stage improves the initial estimate by providing the maximum change in distance between the two closest clusters in each hierarchical stage and then reducing the best number of clusters on the basis of Schwarz's Bayesian inference criterion (BIC), proposed by Fraley and Raftery (1998). BIC is a well-known technique that is used to estimate the maximum number of clusters and is essential to avoid the arbitrariness of the traditional clustering method.

3.10.2 Factor Analysis

Factor Analysis can be used as an exploratory method when the researcher has no prior understanding of a large set of variables to construct a set of interpretable variables. Factor analysis attempts to derive a set of latent variables from a set of observed variables. Generally, there are two main disciplines of factor analysis, such as exploratory factor analysis (EFA) and confirmatory factor analysis (CFA). When developing the factor structure with no prior hypothesis of pattern of measured variable, EFA commonly has been used to present the possible factor of a set of observed variables. EFA is based on the common factor model, which this technique supposes is a measured variable that may be associated with any other factor. The EFA Model is $Y = X\beta + E$, where Y is a matrix of measured variables,

X is a matrix of common factors, β is a matrix of weights (factor loadings) and E is a matrix of unique factors and error variation. When using the hypothesis testing, CFA has been used to confirm the factor of a set of observed variables by using knowledge from theory and empirical research, and then to test the hypothesis statistically to understand a relationship between the observed variables and their causal latent constructs occurrence (Suhr, 2006, Bryant and Yarnold, 1995).

One of the most well known data reduction techniques in multivariate analysis is principal component analysis (PCA), sometimes considered as Empirical Factor Analysis. PCA is generally used across a wide range of domains, often used in Social Sciences and Business under the name of factor analysis. Generally, Jolliffe (2002) mentions that the other term of "Principal component analysis" is maybe used as "factor analysis", "eigenvector analysis" or "latent vector analysis". PCA is used to determine optimal ways of combining variables into smaller group of new components, which account for most of the variance of the observed variables and are suitable to use when variables are highly correlated. PCA considers all of the original variance, while factor analysis uses only common variance in the data. In this study, the PCA technique may be used to reduce the number of variables to components and use the principal component regression score to construct a model, which will be shown within the ERM principal component context. In addition, principal component analysis will produce a form of the original variables as a set of new variables, which are statistically independent. Therefore, PCA can solve multicollinearity problems (Dunteman, 1989).

3.10.2.1 Principal component analysis

PCA is a method of multivariate statistics that is a variable reduction method. Campbell and Atchley (1981) defined PCA analysis as *"a rotation of the axes of the original variable coordinate system to new orthogonal axes, called principle axes, such that the new axes coincide with direction of maximum variation of the original observation"*. It is a way to reduce data into a smaller dimensionality. The

main component of PCA is a standardised linear outcome of optimally-weighted observed variables. This is a well-established technique for dimension reduction that reduces the elements of a large number of correlation variables, which remain uncorrelated in the data set Jolliffe (1986), based on summarising the total variance. On the belief of some redundancy in variables, PCA was used to reduce the number of variables by changing a set of correlated response variables into a minor group of uncorrelated variables called the principal component. The few variables are chosen from all the original variables by reducing the problem of an eigenvalue and eigenvector for a positive-semi-definite symmetric matrix. Alexander (2001) points out that:

- 1) *“The first principal component explains the greatest amount of the total variation in X, the second component explains the greatest amount of the remaining variation, and so on;*
- 2) *The principal components are uncorrelated with each other.”*

3.10.2.2 PCA method to build a multi-dimensional score

Based on an eigenvalues and eigenvectors analysis for each principal component, PCA forms the original variables into a group of uncorrelated principal components by rotating the original axes of the variables to construct a new set of axes, where each principal component is a linear weighted grouping of the original variables, $PC_i = a_{i1}X_1 + a_{i2}X_2 + \dots + a_{ip}X_p$ where PC is a matrix of observed variables, known as principal components. X is a matrix of scores on components, a is a matrix of eigenvectors which represents the weights. In mathematical terms, principal components from a set of variable x_1 through to x_p where a_{pp} represents the weight for the principle variable and the variable is as follows:

$$C = \mathbf{XA}' = \begin{cases} \mathbf{c}_1 = a_{11}\mathbf{x}_1 + a_{12}\mathbf{x}_2 + \dots + a_{1p}\mathbf{x}_p \\ \mathbf{c}_2 = a_{21}\mathbf{x}_1 + a_{22}\mathbf{x}_2 + \dots + a_{2p}\mathbf{x}_p \\ \dots \\ \mathbf{c}_p = a_{p1}\mathbf{x}_1 + a_{p2}\mathbf{x}_2 + \dots + a_{pp}\mathbf{x}_p \end{cases}$$

$\mathbf{C} = \{\mathbf{c}_j\}_{j=1,\dots,p} = \{c_{ij}\}_{i=1,\dots,n; j=1,\dots,p}$ is a $n \times p$ matrix of principal component scores, with p columns (one for each principal component \mathbf{c}_j) and n rows (one for each statistical unit)

\mathbf{X} is the usual $n \times p$ data matrix $\mathbf{A} = \{\mathbf{a}_j\}_{j=1,\dots,p} = \{a_{ij}\}_{i=1,\dots,p; j=1,\dots,p}$ is the $p \times p$ matrix of *component loadings*

PCA used the rotation by finding the eigenvector of the correlation matrix or sometimes by using the co-variance matrix to provide the weights for each principal component. The variance (λ) for each of the principal components is derived by all eigenvectors that correspond to the given eigenvalue. The eigenvalue represent the amount of variance in the total sample and account for each factor. Eigenvectors provide the weights in the linear combinations of the variable, often called scores.

The principal components are usually ordered starting with the first component having the highest eigenvalue, 2nd next highest, and so on. The 1st principal component alone can be explained as the largest possible amount of the variation of the original variables, with the constraint that all the sum of weight ($a_{11} + a_{12} + \dots + a_{1p}$) is equal to 1. As the sum of the eigenvalues equals the number of the original variables, the proportion of the total variation in the original data set accounted by each principal component is given by λ_i/n where n is the number of variables.

PCA is useful when the responses to question might correlate with the other responses. This technique can guide reduction the observed variables into possibly the meaningful new variables. Therefore, the benefit of PCA is it can provide the possibility of gaining a clear view of the variable and the possibility of using the result in subsequent analysis (Stevens, 1992).

3.10.3 Partial Least Square Regression

PLS was introduced by Wold et al. (1984) and is well known in the scientific contexts (Stone and Brooks, 1990), especially in an industrial application (Tobias,

1995). The fundamentals of PLS are related to extracting latent factors when there still remains factor variation in modelling, which is sometimes called a projection to latent structure that is still unobserved in structural equation modelling (Rännar et al., 1994). PLS is a soft modelling used in constructing a predictive model when there are many variables that are highly collinear with a dependent variable. With the emphasis on prediction, the PLS method served well in extracting a number of latent factors that are based on the dependent (outcome) variables, unlike the PCA method that only uses predictive variables with no importance given to dependent variables. Therefore, PLS is more effective than PCA in predicting the dependent variables due to the nature of its algorithm (Maitra and Yan, 2008). Also, Stone and Brooks (1990) noted that PLS could be described as the best possible compromise in multivariate application between OLS and PCA.

Following Maitra and Yan (2008), the PLS method has been used to try to construct linear compositions of X and J equal, where X is $n \times p$ matrix of the X variables and J is a $n \times q$ matrix of the J variables or equal $n \times 1$ matrix as a single dependent variable so the equation is:

$$X = TP' + E$$

$$J = UQ' + F$$

where $T=X$ -scores; $U=J$ -scores; $P=X$ -loadings; $Q=J$ -loadings; $E=X$ -residuals $F=J$ -residuals. The algorithms follow an iterative method to extract a set of factors and explain the maximum of the covariance as possible between T and U. The regression model $\hat{J} = XB + B_0$, referred to as 'PLS regression' where the estimates of B and B_0 are based on the single value decomposition of the X to predict values of J. The regression parameter is estimated by dependent variables.

3.10.4 Measures of the Predictive ability of a Model

To decide which ERM method is the most appropriate method for prediction of ERM implementation, the generalised R-square is initially used as a goodness-of-fit and then the Akaike information criterion (AIC). These measures can be used

as the selection method of the best statistical model. These are briefly described below.

3.10.4.1 Generalised R-Square Estimate

R-square (R^2) or more is usually used as a modification as adjusted R^2 is a statistical measure for goodness-of-fit of a model, which is also known as the coefficient of determination for the regression model. The adjusted R^2 is a modified form of R^2 that has been considered because of the increasing number of predictors in the model. It indicates the percentage of variance in the dependent variable that is explained by the predictors, which show how well the data fits in the linear regression model. R^2 ranges from 0 to 1. The higher adjusted R^2 shows more explanatory power by comparing regression models that include different numbers of predictors.

However, the adjusted R^2 can only be used to linear regression with a continuous dependent variable. Therefore, with ordinal linear regression and logistic regression, the statistician developed a pseudo- R^2 measure with several methods to choose from, including McFadden's, McKelvey and Zavoina's, Cox and Snell's and Nagelkerke's pseudo- R^2 measures. In SPSS, there are two general forms of pseudo- R^2 measures in the output, which are Cox and Snell's and Nagelkerke's measurements. Cox and Snell's R^2 is based on calculating the percentage of unexplained variance. From a practical point of view, this method has a major difficulty in interpreting the result because its maximum can be less than 1. Therefore, Nagelkerke's R^2 was developed by dividing Cox and Snell's R^2 by its maximum to adjust its range variation from 0 to 1. Cox and Snell's R^2 , or Nagelkerke's R^2 , is an appropriate measure goodness of fit to use in ordinal regression.

The R^2 method considers only a measure of the goodness of fit characteristic by neglecting the complexity of the model; therefore, the AIC method is introduced as a trade-off between goodness of fit and complexity that influences a reduction of estimated information loss (Faraway, 2005). The AIC model is considered in this study and will be described in the following section.

3.10.4.2 The Akaike information criterion

The Akaike information criterion (AIC) is a well-known model selection method (Wagenmakers and Farrell, 2004, Kieseppä, 2003), which uses a relationship between an Kullback-Leibler information theoretical approach (Kullback and Leibler, 1951) and maximum likelihood as an objective instrument. This is done by trying to minimise the loss of information during the selection of a quality of a statistical model, amongst a given set of alternative models (Burnham and Anderson, 2002). The selected model is the one that is the most appropriate trade-off between the statistical goodness of fit and the number of parameters. The value of the AIC index will be higher as a penalty for the addition parameters. The smallest value of the AIC index was shown to be the best econometric model, with an adequate degree of fit and a minimum number of parameters. The simple AIC criterion for parametric model selection is defined as:

$$AIC = -2\log(\hat{\theta}_i) + 2k$$

where k is the number of parameters that are estimated and $\hat{\theta}_i$ is the likelihood function refers as $\hat{\theta}_i = (y_i, i = 1, \dots, n, x, \beta, \sigma)$. The log likelihood model can be defined as:

$$\log(\hat{\theta}_i) = -\frac{n}{2}\log(2\pi\hat{\sigma}^2) - \frac{1}{2\hat{\sigma}^2} \sum_{i=1}^n (y_i - x_i\hat{\beta})^2$$

Therefore, AIC when the likelihood estimate substitute in the simple model is represented as:

$$AIC = 2k + n\log(2\pi\hat{\sigma}^2) + \frac{1}{\hat{\sigma}^2} \sum_{i=1}^n (y_i - x_i\hat{\beta})^2 \text{ or}$$

$$AIC = 2k + n\log(2\pi) + n\log(\hat{\sigma}^2) + \frac{1}{\hat{\sigma}^2} \sum_{i=1}^n (y_i - x_i\hat{\beta})^2$$

Moreover, the quality of evaluation can be improved by considering the mean expected maximum log likelihood. For the maximum likelihood model, which is represented as the sum of the square residual, can be defined as:

$$\hat{\sigma}^2 = \frac{\sum_{i=1}^n (y_i - \hat{\beta}x_i)^2}{n}$$

AIC when the maximum likelihood estimates and substitute to likelihood estimate AIC criterion, the better model is:

$$AIC = 2k + n \log(2\pi) + n \log \left[\frac{\sum_{i=1}^n (y_i - \hat{\beta}x_i)^2}{n} \right] + n$$

In this research, the analysis and judgement of the best approach of ERM measuring is based on the maximum likelihood of AIC analysis by comparing AIC value on four ERM methods. ERM Scoring is based on the basic assumption that the intervals between each of the scores are the equivalent of an ordinal measurement approach. The simple ERM Scoring method compares with three different methods, such as the cluster analysis approach, principal components analysis (PCA) approach and partial least square analysis (PLS), and is determined on the basis of the relationship with company performances that take into account control variables. The lowest AIC value represents the best appropriate ERM measurement approach.

3.11 Conclusion

This chapter discussed the research design and presented the methodology and models of this study. The quantitative research method was chosen to explore the information needed to answer the research question with the help of both primary and secondary data collection.

This chapter has provided details about the research setting and it justifies why the study was conducted in Thailand. This study is based on surveys of managing

directors from publicly listed firms in the Stock Exchange of Thailand. Based on data that was obtained by regression models, it will be used to determine the relationship between derived scores and the attributes of the organisations. The variables used in this study were also discussed and represented in this part.

The data processes, including the data treatment method, data analysis technique and the method to measure the best prediction of the model was reviewed and discussed in this chapter. Data treatment falls into preliminary data analysis, and the Heckman correction and reliability test was used to ensure that the data collection was both valid to use further in the model and reliable. In the data analysis, the ERM quantitative modelling techniques comprised of cluster analysis, principal component analysis and partial least square, which were discussed, and the method to measure the best prediction, such as generalised R-Square estimate and Akaike Information Criterion, were reviewed.

ERM survey instrument will be explained in Chapter 4. The results of the ERM Scoring methods are included in Chapter 5. The findings of the survey on ERM practice in Thailand will be presented in Chapter 6. The results of ERM and firm performance and the determinant of ERM are in Chapter 7.

Chapter Four

Survey Instrument

4.1 Introduction

This chapter describes the development of the survey instrument. The first step is to identify the ERM components that may contribute to measurement of the level of ERM implementation. A major limitation for researchers in doing this is the lack of unified ERM definition, and so it is hard to determine which components would indicate effective ERM implementation. It is inconclusive as to what are the influential factors in implementing ERM.

By considering the ERM frameworks, it is possible to derive a set of potential ERM components. The well-implemented ERM component can be used as a standard that is applied to all of the listed companies. With a unifying ERM definition, the components can be chosen to measure the effectiveness of ERM implementation. These proposed ERM components could then be enhanced within the companies and improve ERM implementation. These components can then be used to provide a reliable ERM measurement. In this study, these components are employed to conduct a survey instrument in order to determine the level of ERM implementation within the companies. The questionnaire that is used in this study aims to capture the implementation of ERM dimensions.

The structure of this chapter is as follows: section 4.2 constructs the ERM components, section 4.3 outlines the further questions of the questionnaire and the final section is the conclusion.

4.2 Constructed ERM components

This chapter aims to produce a survey instrument that can be used to measure the level of ERM implementation. The ERM measurement needs to be developed to produce a valid scale that reflects the underlying construct of ERM implementation within the company. It is important to use a procedure that leads to a reliable measure of ERM implementation. In this thesis, it was decided to use

a three-step scale developing process. These three steps are: (1) scale conceptualisation or what is to be measured, (2) scale design or how the components are measured, (3) validity and reliability testing. This process is recommended by Churchill (1979) as an approach to developing the measurement of multiple-item constructs. ERM components are constructed in this chapter with their measurements. Validity and reliability testing will be presented in Chapter six.

It is important to have a clear idea of the construction that is to be measured, including a definition and what is to be included (Churchill, 1979). As discussed in Chapter 2, there are many ERM definitions and frameworks, such as COSO ERM, ISO 31000, S&P and CAS (2003). Hence, it is essential to determine a definition or concept of ERM in this study, as a first step of the construction. My ERM definition was clarified after the discussion in the previous chapter. ERM is defined as:

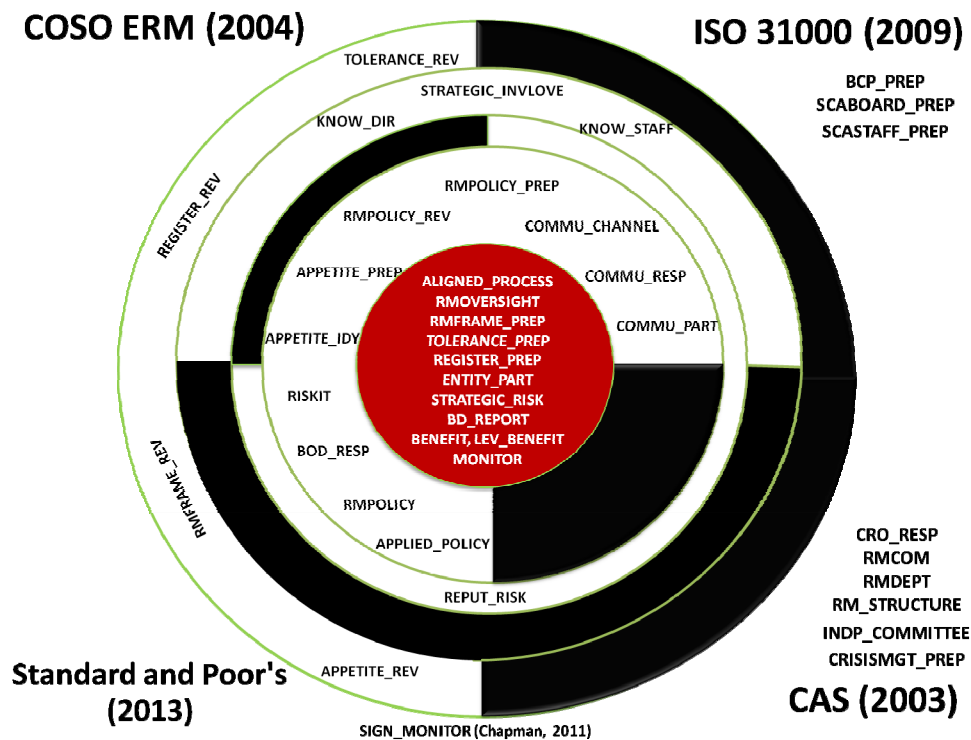
“An integrated framework or the process of managing the interdependencies between the company-wide risk; by which the companies need to create well-organized risk governance and culture, identify, measure, manage and disclose all key risks by receiving support from employees across all levels of a firm thorough effective information, communication and training of staff to increase business performance, the organization’s effectiveness and increase value to stakeholders.”

The next step is to gain insights into the important components in ERM implementation, as then it will be possible to develop procedures to measure them. This step is the most pertinent to the research question. Churchill (1979) recommended the identification of corresponding components. The most common way to discover the component of a construct is through a literature review.

Although ERM frameworks have different components of ERM implementation, most of these components have some common elements. Based on the many regulatory bodies and reviews of literature, a number of common components were observed. This study proposes 40 ERM components in 6 categories as the new measurement method of ERM implementation. This would be accomplished by integrating four generally accepted ERM frameworks, such as COSO ERM,

ISO 31000, S&P and CAS, as well as those from previous literatures. These 40 components can be aggregated as an ordinal equal weight to 40 scores. In chapter 2 (Table 2.6), the components of ERM, taken from various internationally accepted ERM frameworks and previous literatures, were summarised and defined as ERM components.

Figure 4.1 shows the integrating ERM components from ERM frameworks, such as COSO ERM, ISO 31000, S&P and CAS, as well as those from previous literatures. There are five rings in the diagram. The first ring is in the centre (red colour) of the diagram. All ERM frameworks contain 11 components, including *ALIGNED_PROCESS*, *RMOVERSIGHT*, *RMFRAME_PREP*, *ENTITY_PART*, *TOLERANCE_PREP*, *BENEFIT*, *REGISTER_PREP*, *STRATEGIC_RISK*, *BD_REPORT*, *LEV_BENEFIT* and *MONITOR*. In the second ring, there are 11 components that are common to COSO ERM, ISO 31000 and S&P, such as *COMMU_PART*, *COMMU_RESP*, *COMMU_CHANNEL*, *RMPOLICY_PREP*, *RISKIT*, *RMPOLICY_REV*, *APPETITE_PREP*, *APPETITE_IDY*, *BOD_RESP*, *RMPOLICY* and *APPLIED_POLICY*. The third ring, *REPUT_RISK*, is the component found in ISO 31000, S&P and CAS. The fourth ring has three components that are shared between COSO ERM and ISO 31000, including *KNOW_STAFF*, *KNOW_DIR* and *STRATEGIC_INVOLVE*. In the last ring, there are the 4 components that COSO ERM and S&P have in common, including *TOLERANCE_REV*, *REGISTER_REV*, *RMFRAME_REV* and *APPETITE_REV*. Outside the circle, there are 10 components from individual frameworks and previous literature. Six other ERM components can be found in CAS: *CRO_RESP*, *RMCOM*, *RMDEPT*, *RM_STRUCTURE*, *INDP_COMMITTEE* and *CRISISMGT_PREP*. Three ERM components are only found from ISO 31000, such as *BCP_PREP*, *SCABOARD_PREP* and *SCASTAFF_PREP*. The last component is *SIGN_MONITOR*, which is recommended by Chapman (2011). The definitions and measurements of the variables will be presented in further detail.



(Black Shade = Missing from the associated) standards)

Figure 4.1 Integrating ERM components

These components can be divided into 6 categories: 1) fundamental ERM, 2) the existence of ERM evidence, 3) risk management structure and architecture, 4) risk management policy and risk appetite, 5) responsibilities and accountability, 6) the risk management process, including identifying and managing risk, communication, training and knowledge development, as well as technology and monitoring.

The components, variable definitions and scales that are proposed in this research are consistent with the research question, as follows.

4.2.1 Fundamentals of ERM variable

ERM can be regarded as a centralisation risk process that helps boards of directors and top managements to consider the risk more holistically and link it strategically, so that it can achieve the organisation's objectives. The company should align risk into the business process and consider risk oversight within the company's strategy in order to make strategic decisions regarding the achievement of the entity's objectives. What underlies ERM implementation is the fact that boards should realise the benefits of ERM and embed ERM across the organisation. Therefore, it becomes a top priority for directors and executive management to integrate the overall risks in the strategic planning and strategic execution that is processed by the organisation to achieve the company's objective. Risk mindset and strategic development cannot be ignored if there is to be an effective management (COSO, 2004 and ISO, 2009).

The fundamental concept of ERM can be categorised into 5 components (5 scores). These include whether the company ensures risk management and strategic decision making involves the board of directors and top management (*STRATEGIC_INVLOVEMENT*), whether the company's aligned business risks in its routine corporate process (*ALIGNED_PROCESS*), whether the company is concerned about risk oversight with the company's strategy (*RMOVERSIGHT*) and whether the company sees the perceived benefit of risk (*BENEFIT*). These four variables are all dichotomous (yes =1, no = 0). For the last components in this categories, the *LEV_BENEFIT* variable captures the level of ERM benefits, including those that are considered critical to achieving their business goal; identify alignment to strategic management; help to manage predictable and unpredictable events; are seen as a business opportunity; that enhance the company's ability to be better-informed; that promote management efficiency at all levels and prevent unwelcome surprises. This variable is defined as a proportion of these seven sub-benefit variables. All of these sub-variables are of equal weight as 1 component. It can be expected that all of these variables will be positively associated with more mature ERM implementation. Table 4.1 presents the fundamental concept of risk management variables and measurements. The survey's questions about the fundamentals of ERM are represented in Table 4.2.

Table 4.1 A summary of the fundamental concept of risk management measures

No	Q no.	Variable Name	Variable Description	Measurement
1	Q 2	ERM1 <i>STRATEGIC_INVLOVEMENT</i>	Strategic decision of the company, involving the board or top management level	This variable takes the value +1 if discussions on risk management have taken place at board or top management level when strategic decisions are made, and 0 otherwise
2	Q 4	ERM2 <i>ALIGNED_PROCESS</i>	The presence of identified aligned business risks in its routine, corporate and business unit process	This variable takes the value of +1 if aligned identified business risks exist and are included in its routine corporate and business unit process, and 0 otherwise
3	Q 5	ERM3 <i>RMOVERSIGHT</i>	Concerning risk oversight/management that is aligned with the company's strategy	This variable takes the value of +1 if the company's risk oversight/management is aligned with the company's strategy, and 0 otherwise
4	Q 6	ERM4 <i>BENEFIT</i>	The perceived benefit of risk management is addressed	This variable takes the value of +1 if there is a perceived benefit from risk management, and 0 otherwise.
5	Q 6.1	ERM5 <i>LEV_BENEFIT</i>	The level of benefits to enterprise risk management were: <ul style="list-style-type: none"> - Considered critical to the achievement of the business goal - Identified alignment to Strategic Management - Helped to manage predictable and unpredictable events - Seen as a business opportunity - Enhanced the company's ability to be better informed - Promoted management efficiency at all levels - Risk Management can prevent unwelcome surprises. 	This variable equals the percentage of the seven benefit variables on how the company perceives the benefits of risk management

Table 4.2 Survey questions about the fundamentals of ERM

NO.	Q	Questions
Fundamental of ERM		
1	Q2	Have there been any discussions of risk management that have taken place at board or top management level when strategic decisions are made?
2	Q4	Does your company identify business risks and align them into your routine corporate and business unit process?
3	Q5	Is your company concerned whether risk oversight/management is aligned with the company's strategy?
4	Q6	Do you receive benefits from risk management?
5	Q6.1	How do you perceive the benefits that you receive from risk management?

4.2.2 Existence of ERM evidence variable

If an organisation has implemented ERM, then there should be observable evidence of this action (S&P, 2005). The ERM infrastructure consists of an overall risk management policy, a designed risk management framework and risk assessment guidance, including risk appetite and risk tolerance, the presence of risk management on the board's agenda and clarity about risk management's role and responsibilities, as well as a risk report and a portfolio view of risk (Protiviti, 2006). ISO (31000) additionally focuses on the scope of the risk responses that are available for hazard risks. The evidence of continuity planning, disaster recovery planning or crisis planning should be established and regularly tested to support effective risk management by way of the risk architectural strategy and protocol for the enterprise. These pieces of evidence show that ERM implementation exists within the company.

There are 14 components (14 scores) that describe the existence of formal evidence of ERM implementation. When both preparing and reviewing the existence of ERM evidence, the proposed ERM measurement variables include risk management policy (*RMPOLICY_PREP* and *RMPOLICY_REV*); risk management framework or guidelines (*RMFRAME_PREP* and *RMFRAME_REV*); risk appetite (*APPETITE_PREP* and *APPETITE_REV*); risk tolerances (*TOLERANCE_PREP* and *TOLERANCE_REV*) and risk register/risk portfolio (*REGISTER_PREP* and *REGISTER_REV*).

In addition, evidence of the preparation, as recommended by CAS 2003, refers to crisis management (*CRISISMGT_PREP*) and is suggested by ISO 31000. These include a business continuity plan (*BCP_PREP*), self-control assessment at board level (*SCABOARD_PREP*) and staff level (*SCASTAFF_PREP*). These variables are all dichotomous (yes =1, no = 0).

If the company prepared and reviewed these proposed pieces of evidence, the ERM maturity can be expected to increase. Table 4.3 presents the existence of ERM evidence variables and measurements. The survey questions about ERM evidence are represented in Table 4.4.

Table 4.3 Summary of the existence of ERM evidence measures

No	Q no.	Variable Name	Variable Description	Measurement
1	Q 7	ERM6	<i>BCP_PREP</i> Business Continuity Plan – Evidence of Preparation	This variable takes the value of +1 if there exists evidence of a Business Continuity Plan prepared, and 0 otherwise
2	Q 7	ERM7	<i>CRISISMGT_PREP</i> Crisis Management – Evidence of Preparation	This variable takes the value of +1 if there exists evidence of Crisis Management prepared, and 0 otherwise
3	Q 7	ERM8	<i>SCABOARD_PREP</i> Self-Control Assessment by Board of Directors – Evidence of Preparation	This variable takes the value of +1 if there exists evidence that the self-control assessment has been prepared by the board of directors, and 0 otherwise
4	Q 7	ERM9	<i>SCASTAFF_PREP</i> Self-Control Assessment by all staff – Evidence of Preparation	This variable takes the value of +1 if there exists evidence that Self Control Assessments have been prepared by all staff, and 0 otherwise
5	Q 7	ERM10	<i>RMPOLICY_PREP</i> Risk Management Policy – Evidence of Preparation	This variable takes the value of +1 if there exists evidence that Risk Management Policy has been prepared, and 0 otherwise
6	Q 7	ERM11	<i>RMPOLICY_REV</i> Risk Management Policy – Evidence of a Review	This variable takes the value of +1 if there exists evidence of the Risk Management Policy being reviewed, and 0 otherwise
7	Q 7	ERM12	<i>RMFRAME_PREP</i> Risk Management Framework or Guidelines – Evidence of Preparation	This variable takes the value of +1 if there exists evidence of a Risk Management Framework or Guidelines being prepared, and 0 otherwise
8	Q 7	ERM13	<i>RMFRAME_REVI</i> Risk Management Framework or Guidelines – Evidence of a Review	This variable takes the value of +1 if there exists evidence of the Risk Management Framework or Guidelines being reviewed, and 0 otherwise
9	Q 7	ERM14	<i>APPETITE_PREP</i> Risk Appetite – Evidence of Preparation	This variable takes the value of +1 if there exists evidence of Risk Appetite being prepared, and 0 otherwise
10	Q 7	ERM15	<i>APPETITE_REVI</i> Risk Appetite – Evidence of a Review	This variable takes the value of +1 if there exists evidence of Risk Appetite being reviewed, and 0 otherwise
11	Q 7	ERM16	<i>TOLERANCE_PREP</i> Risk Tolerances – Evidence of Preparation	This variable takes the value of +1 if there exists evidence of Risk Tolerances being prepared, and 0 otherwise

No	Q no.	Variable Name	Variable Description	Measurement
12	Q 7	ERM17 <i>TOLERANCE_REV</i>	Risk Tolerances – Evidence of a Review	This variable takes the value of +1 if there exists evidence of Risk Tolerances being reviewed, and 0 otherwise
13	Q 7	ERM18 <i>REGISTER_PREP</i>	Risk Register/ Risk Profile/Risk Portfolio – Evidence of Preparation	This variable takes the value of +1 if there exists evidence of the Risk Register/ Risk Profile/Risk Portfolio being prepared, and 0 otherwise
14	Q 7	ERM19 <i>REGISTER_REVI</i>	Risk Register/ Risk Profile/Risk Portfolio – Evidence of a Review	This variable takes the value of +1 if there exists evidence of the Risk Register/ Risk Profile/Risk Portfolio being reviewed, and 0 otherwise

Table 4.4 Survey questions about the existence of ERM evidence

NO.	Q	Questions
<u>The existence of ERM evidence</u>		
1	Q7	Business Continuity Plan – Evidence of Preparation?
2	Q7	Crisis Management – Evidence of Preparation?
3	Q7	Self-Control Assessment by boards – Evidence of Preparation?
4	Q7	Self-Control Assessment by all staff – Evidence of Preparation?
5	Q7.1	Risk Management Policy – Evidence of Preparation?
6	Q7.1	Risk Management Policy – Evidence of Review?
7	Q7.1	Risk Management Framework or Guidelines – Evidence of Preparation?
8	Q7.1	Risk Management Framework or Guidelines – Evidence of Review?
9	Q7.1	Risk Appetite – Evidence of Preparation?
10	Q7.1	Risk Appetite – Evidence of Review?
11	Q7.1	Risk Tolerances – Evidence of Preparation?
12	Q7.1	Risk Tolerances – Evidence of Review?
13	Q7.1	Risk Register/ Risk Profile/Risk Portfolio – Evidence of Preparation?

4.2.3 Risk management structure and architecture variable

CAS (2003) mentioned that for an effective ERM structure to exist, the company should establish a risk management committee and risk management department. A formal and independent ERM organisational structure is a basic requirement of an effective ERM implementation (S&P, 2005).

Therefore, risk management, structure and architecture comprise of 3 components (3 scores), including the existing risk management committee (*RMCOM*), the existing risk management department (*RMDEPT*) and the independence of the risk management structure (*RM_STRUCTURE*).

For *RMCOM* and *RMDEPT*, these variables take a positive value if a risk management committee and risk management department exists, and 0 otherwise. For *RM_STRUCTURE*, different companies usually have a different risk management structure and the expectation is that a risk management department and risk management committee which reports directly to the board of directors or top management level will be positively associated with ERM maturity. Whilst the risk management system is under the control of either the financial department or internal control, then having an internal audit will not increase ERM maturity.

If these proposed components exist, it can be expected that the company will gain a positive ERM structure and its architecture components and ERM maturity will be increasing. Table 4.5 presents the risk management structure and architecture variables and measurements. The survey questions about risk management structure and architecture are represented in Table 4.6.

Table 4.5 Summary of the risk management structure and architecture measures

No	Q no.	Variable Name	Variable Description	Measurement
1	Q 8	ERM20 <i>RMCOM</i>	Existence of a risk management committee	This variable takes the value of +1 if there exists a Risk management committee, and 0 otherwise
2	Q 8	ERM21 <i>RMDEPT</i>	Existence of a risk management department	This variable take the value of +1 if there exists a risk management department, and 0 otherwise
3	Q 9	ERM22 <i>RM_STRUCTURE</i>	Existence of an independent risk management structure <ul style="list-style-type: none"> - Under a risk management committee, which is directed to the Management Committee - Under a risk management committee, which is directed to the Board of Directors - Under a risk management department, which is directed to the risk management committee and the Board of Directors - Under a risk management department, which is directed to the risk management committee and the Board of Directors, but needs to report risk related to the CEO - Under the risk management department, which is directed to the Chief Executive Director or management - Under risk management department, which is directed to the Finance and Accounting Department and CEO, and the risk management committee is independent under the Board of Directors 	This variable takes the value of +1 if the structure of risk management is separate from the internal control structure and 0 otherwise

Table 4.6 Survey questions about risk management structure and architecture

NO.	Q	Questions
<u>Risk management structure and architecture</u>		
1	Q8	Is there a risk management committee that is separate from the audit committee?
2	Q8	Is there a risk management department?
3	Q9	Which organisational structure of risk management does your company have?

4.2.4 Risk management policy and risk appetite variable

A risk management policy regarding an enterprise-wide approach is an effective method of introducing risk awareness throughout the firm. This should be developed and communicated to all staff throughout the enterprise, so that they can understand it in the same way (Moeller, 2007) and it can then be applied across the entire enterprise (COSO, 2004). S&P (2005) also suggests that a strong ERM is consistent and directly linked to the establishment of a well-defined risk appetite and the management's ability to operate with stated risk tolerances and an understanding of the risk profile.

Risk management policy and risk appetite comprises of 3 scores (3 scores). These components include an established risk management policy regarding an enterprise-wide approach (*RM POLICY*), determined risk appetite (*APPETITE_IDY*) and the level of risk management that is applied across the company (*APPLIED_POLICY*). When it comes to *RM POLICY* and *APPETITE_IDY*, these variables are positive to ERM maturity if the components are established. For *APPLIED_POLICY*, there are three levels that the company might apply to their risk management policy. Recommended best practice is that the risk management policy is applied across the organisation. This variable takes the positive value of 1. The second is applied to the business unit level, 0.5 if it is applied at this level, and no score if the risk management policy is applied only in the treasury/finance and insurance departments. Table 4.7 presents the risk management policy and risk appetite variables and measurements. Survey questions about the risk management policy and risk appetite are represented in Table 4.8.

Table 4.7 Summary of risk management policy and risk appetite measures

No	Q no.	Variable Name	Variable Description	Measurement
1	Q 10	ERM23 <i>RMPOLICY</i>	Existence of a risk management policy regarding an enterprise-wide approach	This variable takes the value of +1 if the risk management policy is acknowledged regarding an enterprise-wide approach, and 0 otherwise
2	Q 12	ERM24 <i>APPLIED_POLICY</i>	The level of companies that apply a risk management policy	This variable takes the value of +1 if it is applied across the enterprise, +0.5 if it is applied in the business unit accountability, and 0 if applied in treasury, insurance and otherwise
3	Q 22	ERM29 <i>APPETITE_IDY</i>	Determined risk appetite	This variable takes the value of +1 if risk appetite is acknowledged in the entity, and 0 otherwise

Table 4.8 Survey questions about risk management policy and risk appetite

NO.	Q	Questions
<u>Risk management policy and risk appetite</u>		
1	Q10	Does your company have a formal risk management policy regarding an enterprise-wide approach?
2	Q12	At what level does your company apply a risk management policy?
3	Q22	Has your company determined its risk appetites?

4.2.5 Responsibilities and accountability

AON (2010) points out that to leverage existing best practices while implementing an ERM framework is essential in order to engage with clear lines of responsibility, authority and accountability from the board level, through management levels to operational levels. By appointing the right person to the right role, with a clear separation of duties, companies will maintain an equilibrium between risk-taking and risk monitoring (KPMG, 2010), with all individuals at all levels being able to acknowledge their roles and accountabilities relating to the risk management process, as well as their contribution to achieving the company's objective.

Responsibilities and accountability comprise of 5 components (5 scores). A key feature of ERM is that all members of the company have a responsibility to both support the company's risk policy and promote compliance within its risk appetite (*ENTITY_PART*). The board of directors has the final responsibility and ownership of the oversight of ERM (*BOD_RESP*) with a periodic risk report system (*BD_REPORT*), and appropriate delegate risk management roles, assigned to the risk leader, CRO or risk management committee (*CRO_RESP*). In addition, the presence of a risk management committee should be separately established from the audit committee (*INDP_COMMITTEE*). These components should consider the effectiveness of the responsibilities and accountability structure within the company.

Table 4.9 presents the responsibilities and accountability variables and measurements. The survey questions about responsibilities and accountability are represented in Table 4.10. The five variables included are positively associated with ERM maturity if the company engages in substantive ERM for the responsibilities and accountability components.

Table 4.9 Summary of responsibilities and accountability measures

No	Q no.	Variable Name	Variable Description	Measurement
1	Q 13	ERM25 <i>BD_REPORT</i>	Frequency that the Board of Directors discuss or receive reports on risk management	This variable takes the value of +1 if the board of directors have discussed or received reports on risk management every month or more, and if it is less than 12 times a year the variable is a percentage of the frequency of the Board of Directors meetings
2	Q 15	ERM40 <i>INDP_COMMI TTEE</i>	The presence of a risk management committee that is separate from the audit committee	This variable takes the value of +1 if there exists a risk management committee that is separate from the audit committee, and 0 otherwise
3	Q 20	ERM26 <i>BOD_RESP</i>	The Board of Directors are responsible for the overall risk management process activities at an entity level	This variable takes the value of +1 if the Board of Directors is primarily responsible for the overall risk management process activities of the risk functions at an entity level, and 0 otherwise
4	Q 20	ERM27 <i>CRO_RESP</i>	The Risk Management Committee, Chief Risk Officer and risk management department are responsible for the overall risk management process activities at an entity level	This variable takes the value of +1 if the Risk Management Committee, Chief Risk Officer and risk management department are primarily responsible for the overall risk management process activities of the risk functions at an entity level, and 0 otherwise
5	Q 20	ERM28 <i>ENTITY_PART</i>	Every person in the company is involved in the risk management process	This variable takes the value of +1 if everyone in the company is involved in the risk management process, and 0 otherwise

Table 4.10 Survey questions about responsibilities and accountability

NO.	Q	Questions
<u>Responsibilities and accountability</u>		
1	Q13	How often does the board of directors discuss or receive reports on risk management?
2	Q15	Is the risk management committee separate from the audit committee?
3	Q20	Is the board of directors primarily responsible for risk management?
4	Q20	Is the risk management committee/Chief Risk Officer/risk management department primarily responsible for the risk management process?
5	Q20	Does the entity level/across the company participate in the risk management process?

4.2.6 Risk Management Process

The rest of the 10 components (10 scores) come from the framework of the effective ERM implementation process. This starts from identifying and controlling risk, effective communication throughout the firm, providing training and knowledge development to both management and all staff, as well as adequate technology and information systems to support the risk management system and monitor risk management on a timely basis.

The first 2 components of interest ask whether the company identifies and manages strategic risk (*STRATEGIC_RISK*) and reputation risk (*REPUT_RISK*). These two types of risks are the key risks of ERM, from the general type of risks (there are three type of risks in COSO internal control framework: operation risk, compliance risk, reporting risk). Identifying and managing these risks could lead to a better level of ERM implementation.

There are three additional variables of interest focus on the effectiveness of communication within the company. *COMMU_PART* represents the maturity of ERM, which is contingent on providing clear communication of its expectations for risk taking to responsible persons. This study also added a *COMMU_RESP* variable to ask whether the company has clear documents or standards for risk taking and risk management that are widely understood within the company. The last *COMMU_CHANNEL* variable equally weighted 8 sub-components in order to gain effective risk communication, including risk management as a corporate culture; a fully communicated and acknowledged policy and procedure; policies and procedures in writing, clearly stated in the functional job descriptions or job manual of all units; an understanding of their role and responsibility; establishing self-assessment of employees and directors; and a whistle-blower system.

The next 2 components considered whether training existed, coaching or educational programmes about risk management were offered to directors (*KNOW_DIR*) and staff (*KNOW_STAFF*). This was based on an expectation that formal training in ERM should help management and staff to better understand risk oversight and

enhance the risk culture across the enterprise. If a company has risk management training, it can be expected that it will have a positive approach that is associated with more mature ERM implementation. Effective risk information systems are included as a *RISKIT* variable in these analyses. This variable takes the positive 1 value if risk information systems exist that provide adequate information to enable people to identify, assess and respond to risks, and 0 otherwise.

The last 2 components are based on the effectiveness of monitoring the risk management system. This study will use *MONITOR* to identify whether the company has assigned a responsible person to monitor the overall risk management on a timely basis. The final variable is *SIGN_MONITOR*. This variable uses the equal weight of four effective sub-components that should be used to monitor risk management, including early warning indications that are established for operation, benchmarking against policy or best practice, balanced scorecards and Key Performance Indicators (KPI), and enterprise performance appraisal techniques to monitor the effectiveness of the ERM program.

Table 4.11 presents the responsibilities and accountability variables and measurements. The survey's questions about responsibilities and accountability are represented in Table 4.12. These five variables are included as they are positively associated with ERM maturity if the company engages in a substantive ERM for the responsibilities and accountability components.

Obviously, a lack of any of these components is equivalent to a lack of ERM implementation, whereas if all of the components are present then it is highly likely the company is ERM compliant. All of these 40 sub-components provide the required insights into ERM implementation. Therefore, a simple aggregation of these 40 measures, which assume equal weight, can be constructed as the scale method. On the basis of the questionnaire, 24 questions based on these components are formed to gain information about the implementation of ERM.

Table 4.11 Summary of risk management process measures

No	Q no.	Variable Name	Variable Description	Measurement	
1	Q 27	ERM30	<i>STRATEGIC_RISK</i>	Identifies strategic risk	This variable takes the value of +1 if it identifies strategic risk, and 0 otherwise
2	Q 27	ERM31	<i>REPUT_RISK</i>	Identifies reputation risk	This variable takes the value of +1 if it identifies strategic risk, and 0 otherwise
3	Q 29	ERM32	<i>COMMU_PART</i>	Having clear documents or standards for risk taking and risk management that are widely understood within the company	This variable takes the value of +1 if there are clear documents or standards for risk taking and risk management that are widely understood within the company, and 0 otherwise
4	Q 30	ERM33	<i>COMMU_RESP</i>	Providing clear communication of its expectation for risk taking to responsible persons	This variable takes the value of +1 if there is clear communication of its expectation for risk taking to responsible persons, and 0 otherwise
5	Q 31	ERM34	<i>COMMU_CHANNEL</i>	The effectiveness of risk communication: <ul style="list-style-type: none"> - Risk management as a corporate culture - Fully communicated and acknowledged policy and procedure - Policies and procedures in writing - Clearly stated in the functional job descriptions or job manual of all units - Everyone needs to sign that they understand and to give acknowledgement - Self assessment of employees - Self assessment of directors - Concerning the whistle-blower system and complaints 	This variable equals the percentage of eight effective components of risk communication

No	Q no.	Variable Name	Variable Description	Measurement
6	Q 32	ERM35	<i>KNOW_DIR</i> The existence of training, coaching or educational programmes about risk management that is offered to directors	This variable takes the value of +1 if directors receive training, coaching or educational of risk management; + 0.5 if directors receive training programmes in general; and 0 otherwise
7	Q 33	ERM36	<i>KNOW_STAFF</i> The existence of training, coaching or educational programs about risk management that are offered to staff	This variable takes the value of +1 if all staff receive training, coaching or educational of risk management; + 0.5 if the staff receive training programmes in general; and 0 otherwise
8	Q 34	ERM37	<i>RISKIT</i> Existence of risk information systems that provide adequate information to enable people to identify, assess and respond to risk	This variable take the value of +1 if there exists risk information systems that provide adequate information to enable people to identify, assess and respond to risks, and 0 otherwise
9	Q 37	ERM38	<i>MONITOR</i> Having assigned a responsible person to monitor the overall risk management on a timely basis	This variable takes the value of +1 if there exists an assigned person responsible person for monitoring the overall risk management on a timely basis, and 0 otherwise
10	Q 38	ERM39	<i>SIGN_MONITOR</i> Existence of a technique or method used to monitor risk management - Early Warning Indications established for operation - Benchmarking against policy or best practice - Balanced scorecards and Key Performance Indicators (KPI) - Enterprise Performance Appraisal	This variable equals the percentage of four effective components of the risk monitor

Table 4.12 Survey questions about the risk management process

NO.	Q	Questions
<u>Risk management process</u>		
1	Q27	Strategic risk – Identify Risk?
2	Q27	Reputational risk – Identify Risk?
3	Q29	Does your company have clear documents or standards for risk taking and risk management that are widely understood within the company?
4	Q30	Is there a clear communication channel for risk to senior management?
5	Q31	What is the policy or channel of risk communicate throughout the company?
6	Q32	Are there any training, coaching or educational programmes that are being offered to directors on risk?
7	Q33	Are there any training, coaching or educational programs that are being offered to staff on risk?
8	Q34	Does an information system in your company provide adequate information to identify, assess and respond to risks and ultimately achieve its objectives?
8	Q37	Does your company assign a primary responsible person to monitor overall risk management on a timely basis?
10	Q38	Which technique or method does your company use to monitor risk management?

4.3 Exploring further ERM practice question

So far, 40 main ERM components have been established and proposed a method of measurement for these components in this study. Beyond this there is a need to explore other aspects associated with ERM. In order to efficiently measure these aspects further, questions are added to the questionnaire (Sheehan, 2001). Within this context, the result of the questionnaires could provide factual information about the current state of risk management and may allow companies to enhance their risk management in the future.

Stewart and Shamdasani (1990) points out that there are two principles to be considered when formulating questions. The questions should be considered from the general to the specific and ordered in their importance to the research's purpose. Another set of questions was based on relevant literatures to gain insights into various aspects of the risk management practice, the choice of risk management structure, risk management standards, techniques and effectiveness. An additional 20 questions were considered, including 2 questions about understanding general risk management practice and 18 questions on comprehending ERM measurement components related to the six aspects of ERM adoption.

Two general risk management questions were constructed to understand the state and form of risk management and which ERM framework or risk management system the company has, or is considering implementing. Risk Management can be described in different terms. It is therefore useful to find out about the company's general practice. There are various risk management frameworks, e.g. COSO ERM framework, ISO (31000), Regulatory compliance, e.g. BASEL Accords (I, II and III), international standards and COSO internal control framework, which could be used to implement the risk management system. Some companies might apply more than one standard.

The 18 specific questions are related to 6 categories of ERM components. These questions were formed to gain a greater understanding of the proposed 40 ERM components. In the fundamental ERM categories, the question relates to risk

management and the strategic decision process, including who gets involved and how often risk management discussions take place at board or top management level.

Furthermore, the questions about risk management policy and risk appetite categories focus on the process to establish, review and monitor the risk management policy and risk appetite, including suggested techniques that the company could use to identify, manage and evaluate potential risk.

In the responsibilities and accountability categories, the question will lead to knowledge about the number of risk management committees in the company, as well as specific information about the composition of the membership, including how many independent directors, management director, top management, external expertise or other positions are involved.

The last category contains questions related to the risk management process. When it comes to identifying the risk to reputation it is valuable to know what the procedure is to manage its risk. Furthermore, if there are risk management information systems in the company, which types of infrastructures are used? If the company has assigned the responsible person to monitor overall risk management system, who is that responsible person?

All of these questions aim to gain insights into the measurement of risk management and current practice, in the context of the current study. A list of further ERM practice questions is shown in Table 4.13. The final list of questions in the questionnaire was composed, including both the ERM measurement components and an informative insight into ERM adoption. To validate the ERM implementation approach, this study will use data from Thailand. Appendix B shows the ERM research questionnaire used in this study.

Table 4.13 A list of further ERM questions

Q	Questions
Q1	What is the stated form of risk management in your company?
Q19	What standard of risk management is applied for your company's risk management? (Tick as many as apply)
<u>Fundamental of ERM</u>	
Q2.1	If discussions on risk management took place at board level when the company made strategic decisions, who got involved? (Tick as many as apply)
Q3	How often have any discussions on risk management taken place at board level or top management when the company has made strategic decisions?
<u>Risk management policy and risk appetite</u>	
Q10.1	Who is primarily responsible for establishing the risk management policy, and who is accountable for planning, monitoring and reviewing this policy? (Tick as many as apply)
Q11	How often does your company review the risk management or ERM policy?
Q14	Are there any policies or meetings arranged to manage ad-hoc decision making at board level?
Q14.1	Please give the number of general meetings and cases of ad-hoc decision making that have taken place at board level?
Q21	Is there anything that identifies risk appetite or discloses awareness or risk management from the board level or amongst top management in the annual report? And if so, which part of the report?
Q21.1	Refer to question 21. If so, which part?
Q23	Who takes the primary decision and is responsible for identifying, reviewing and monitoring risk appetite?
Q24	If there is risk appetite, how often does your company review it?
Q25	Is there any process to manage either potential events or to identify risk? (Tick as many as apply)
Q26	Are there any techniques used to evaluate risk? (Tick as many as apply)
<u>Responsibilities and accountability</u>	
Q16	Who are the members of the risk management committee and how many members are there?
Q17	How many risk management committee meetings are there each year?
Q18	Is the structure of the risk management committee directly connected to the board of directors or management committee?
<u>Risk management process</u>	
Q27.1	If your company does identify reputational risk, how do you manage this?
Q35	Which risk management information system or infrastructures are used in your company? (Tick as many as apply)
Q36	Who has the responsibility for disclosing accurate, valid and timely information to stakeholders?

4.4 Conclusion

ERM is seen as a holistic approach that should ensure a good risk management strategy that helps companies to minimise potential pitfalls and improve their long-term business sustainability. It is difficult to implement ERM when there are so many alternative definitions and frameworks associated with it. There is little consensus about what the essential components of ERM are. This issue has led to questions whether past ERM implementation has been adequately assessed, and this problem has led to inconclusive empirical studies of ERM. This study is an exploratory study of ERM that aims to propose integral well-implemented ERM components, where the contribution of these components can reflect the company's level of ERM implementation.

Based on various frameworks of ERM, 40 components of ERM implementation have been established in 6 categories, along with identification of the variables and method of measurement. It provides valuable guidance on how companies could identify and measure ERM components. For listed companies, these components should be used to gain a better assessment of level of ERM adoption. Moreover, these components could be added in order to adapt the existing framework and develop a better reflect holistic view of ERM implementation.

Many of the components used identified in this study do not appear to be specified in previous publicly available source. This new survey instrument is proposed to gain insight into ERM implementation. To demonstrate its viability, data was collected from publicly listed firms in Thailand. The questionnaire was able to collect more information about ERM implementation, as well as allowing empirical studies regarding value creation to be carried out and exploring the determinants of ERM implementation.

Chapter Five

Results Survey on Risk Management Practice in Thailand

5.1 Introduction

This chapter presents the initial survey findings on risk management practices in Thailand. At the current time, there is no regulation that obliges Thai listed companies to implement the risk management process. However, many companies have taken a silo-based approach to risk management, while an increasing numbers apply an ERM framework and hope to tackle the problem of TRM. With this in mind, the research embarked on a survey that aims to increase the understanding of the current state of risk management practice in Thailand, as well as the role, process, evidence and other risk functions in this sphere. The ERM performance measurement is included in order to measure and understand the level of risk management in Thai listed companies.

This survey is timely given there are increasing expectations of risk management by stakeholders within the growing ASEAN region. Other countries within ASEAN have required implementation of risk management procedures, such as Singapore and Malaysia, that have issued or revised internal control and risk management guidance for Public Listed Companies, e.g. Malaysia revised the Statement on Internal Control Guidance for Directors of Public Listed Companies (“SIC Guidance”) in 2012 and Singapore issued practical guidance for Boards on risk governance of listed companies in 2012.

The aim of this survey is to provide an independent view of the ERM process and functions in Thailand by outlining the progress and awareness of risk in companies and in ERM implementation. The key objectives of this survey is to identify the current state of corporate risk management; current and planned risk management related responsibility and accountability; current and planning risk management process at the enterprise level and the next practical steps to create effective ERM within enterprises.

5.2 Listed Companies' Background

133 Thai enterprises participated in the survey, and the majority of these were publicly listed companies, with 114 responses (or 85.7 percent), although private companies or mutual holding companies were also represented, with 19 responses (or 14.3 percent). The survey gathered the views of the managing director or person who is responsible for risk management in the firm. It was conducted in the second quarter of 2013. As illustrated in Figure 5.1, the survey participants represented a diverse range of industries, including 22 services firms, 16 financial organisations, 14 property and construction companies, 10 industrial businesses, 10 technology companies, 7 resources industries, 7 agriculture and food businesses, 4 consumer products industries. There are 19 limited companies in the sample and 8 companies are under another businesses group, including 2 companies under rehabilitation. Six did not complete the survey and 16 respondents did not disclose their company name.

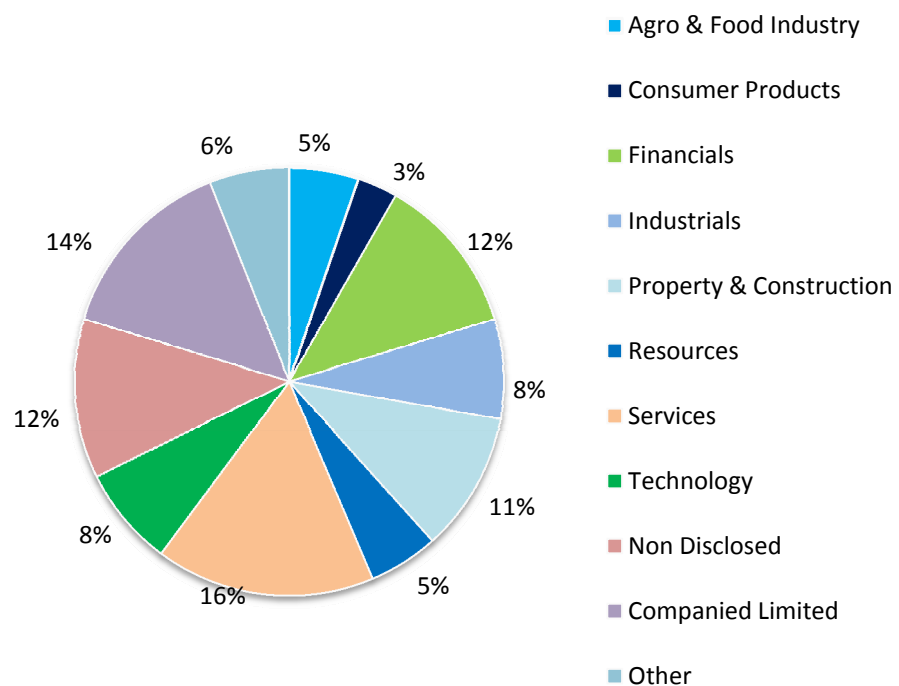


Figure 5.1 Percentage of participants by primary business

Figure 5.2 shows the percentage by asset size of the respondents from the 92 listed companies. 22 companies were excluded, of which 16 did not disclose their company name and 6 did not complete survey. Most of the respondents (43 companies) were listed companies with an asset size of more than 1 billion baht to 10 billion baht (£20 million - £200 million). Secondly, 25 companies had an asset size of more than 10 billion to 100 billion Baht (£200 million - £2000 million). There were 14 companies that had more than 100 billion baht (> £2 billion) and 10 companies had an asset size of less than 1 billion baht (< £20 million).

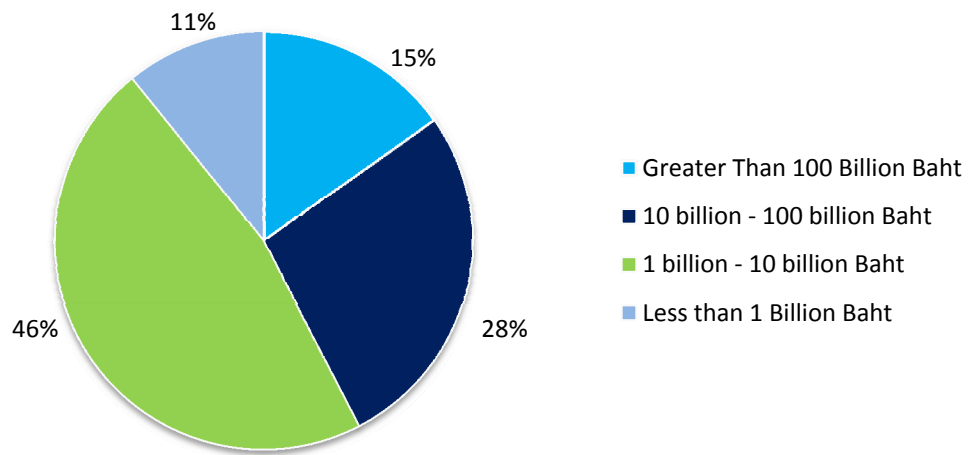


Figure 5.2 Percentage of participants by asset size

5.3 Respondents' Background

The respondents' backgrounds were considered in terms of their ages, highest education qualifications, years they had worked in the company and their position. Table 5.1 provides descriptive statistics that are related to these variables.

Table 5.1: Respondents' descriptive statistics

	Characteristics	N	%
1. Age	1. Less than 35-years-old	27	23.3%
	2. From 35 to 45-years-old	40	34.5%
	3. From 46 to 55-years-old	40	34.5%
	4. More than 55-years-old	9	7.8%
2. Education	1. Bachelor's degree	23	19.8%
	2. Master's degree or higher degree	93	80.2%
3. Years working in the company	1. Less than 5 years	38	33.0%
	2. From 5 to 10 years	31	27.0%
	3. From 10 to 15 years	21	18.3%
	4. From 15 to 20 years	9	7.8%
	5. More than 20 years	16	13.9%
4. Current position	1. Top Management	22	19.8%
	2. Risk Management Committee or Audit Committee	5	4.5%
	3. Chief Risk Officer	14	12.6%
	4. Chief Finance Officer	13	11.7%
	5. Manager	24	21.6%
	6. Senior Officer	11	9.9%
	7. Other	22	19.8%

5.4 Risk Management Background

5.4.1 Establishing a Risk Management System

In response to the questionnaire, Figure 5.3 shows that 110 companies in the survey had some types of risk management system. While 23 companies claimed they had no risk management system established in their firm. While most private companies had not established a risk management system, only a few of the listed companies had no risk management system. There are the differences between the listed companies who have more established risk management system than the limited companies as to which had a risk management system with a likelihood ratio statistic of 7.853 with a p-value of 0.005.

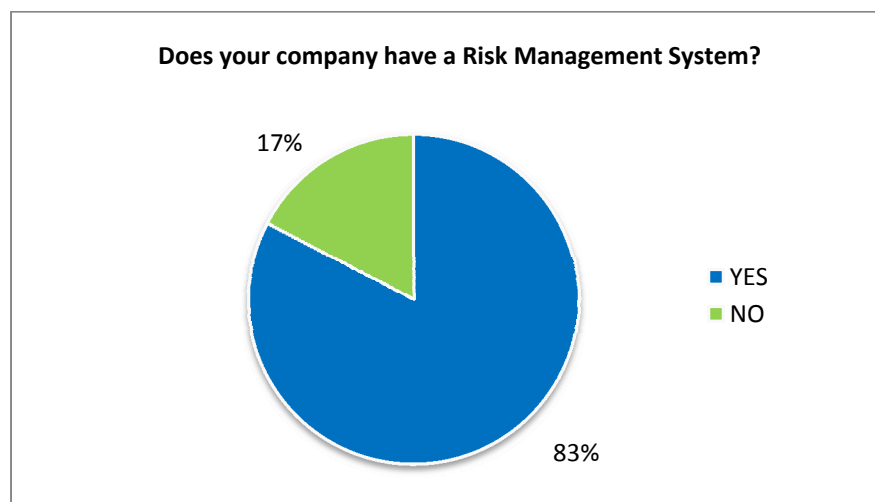


Figure 5.3 Percentage of risk management system established

5.4.2 Current State of Risk Management

Figure 5.4 shows that nearly half of the respondents (52 companies) claimed that they had stated their form of risk management as "Risk Management". The second highest number (32 companies) stated "Enterprise Risk Management". It was found from this survey that risk management can be called many other terms by Thai organisations. The terms associated with risk management can be Corporate Risk Management, Investment Risk Management, etc. This was the respondents' view on how they determined their company's risk management system.

If the companies initially call their risk management system "Enterprise Risk Management", it indicates that the company is likely to be developing an ERM system. Yet if the companies call their risk management system "Risk Management", it indicates possibly that the company is not implementing ERM but may have some of the attributes. Their own definition can be used for cross-analysis with ERM performance questions in order to understand the differences between the groups.

What is the stated form of Risk Management in your company?

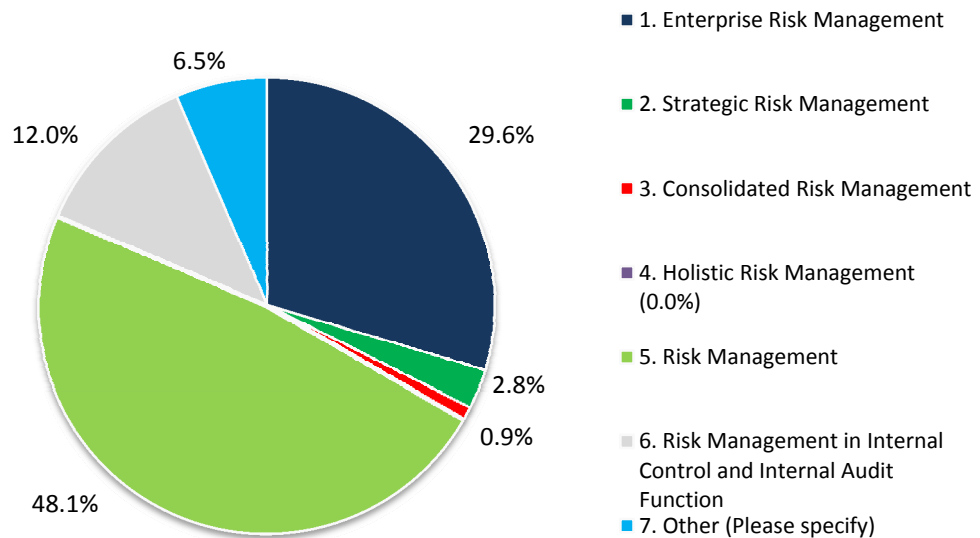


Figure 5.4 Percentage of the stated form of risk management

5.4.3 Risk Management frameworks or guidelines

It is clear from past literatures that the COSO ERM framework is the most popular framework that is currently being used by enterprises worldwide (Beasley et al., 2010, Beasley et al., 2005, Power, 2007, Beasley and Frigo, 2010). The results of this study shown in Figure 5.5 are consistent with prior studies. Majority of respondents identified that their companies used the COSO ERM framework as their risk management standard, while 14 companies applied ISO 31000. Other standards, such as the Securities and Exchange Commission (SEC) policy, AS/NZS 4360 or specified accreditation requirements are found in this study.

It was also revealed in this study that ISO 31000 has become increasingly used as a company's risk management framework in Thailand (13.9 percent of company in Thailand), compared to the Beasley et al. (2010) survey report, which showed that only 1.9 percent of company in US used ISO.

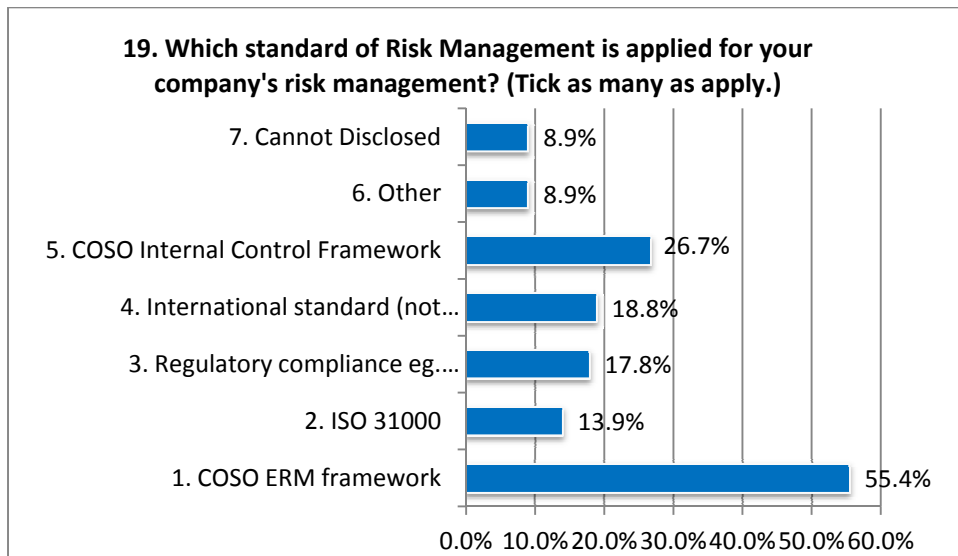


Figure 5.5 Percentage of different risk management frameworks applied

5.5 Results of ERM Performances

5.5.1 Fundamentals of ERM

It was found that 94 companies of respondents had identified business risks into their routine corporate and business unit processes (Q4: ERM 2). Nearly 100 companies considered risk oversight was aligned with their company's strategy (Q 5: ERM 3). In general, most respondents identified business risk and included it in their business and concern risk oversight.

5.5.1.1 Strategic Planning Process

The results show that 102 companies have had discussions on risk management at the board or top management level while making strategic decisions (Q2: ERM 1). It is seen as a positive direction that the majority of respondents had attempted to link strategic planning process with risk management in order to achieve their business

objective. The results in Figure 5.6 show that those in the top management level were the highest participants, the board of directors were the second, and followed by the management committee. Only 26 respondents said their chief risk officer participated in this process.



Figure 5.6 Percentage of strategies involvement

To successfully implement ERM, executive management are required to evaluate various strategic directions that can be taken. This involves considering the combined risks within many scenarios in order to create potential risk opportunities and manage risk within the stakeholder's risk appetite. This is the key to having good management of risk across an organisation. The boards of directors must oversee and be responsible on behalf of the stakeholders that risk is being managed in a proper manner. As with the strategic planning process or any discussion about risk management, most of the companies gave importance to top management, and it can be suggested from this survey that the board of directors should have more involvement in this process.

In addition, the question, “How often have any discussions on risk management taken place at board or top management level?” was asked and Figure 5.7 shows the results.

Around one third of the companies have annual discussions on risk management that are related to the process of strategic decisions. Nearly half have discussions more than once a year (34 companies have quarterly discussions and 14 companies have them twice a year). Risk management has been discussed at board or top management level at least once a year, and it could be recommended that this should take place on a quarterly basis. Formal meetings should be set up on a regular basis.

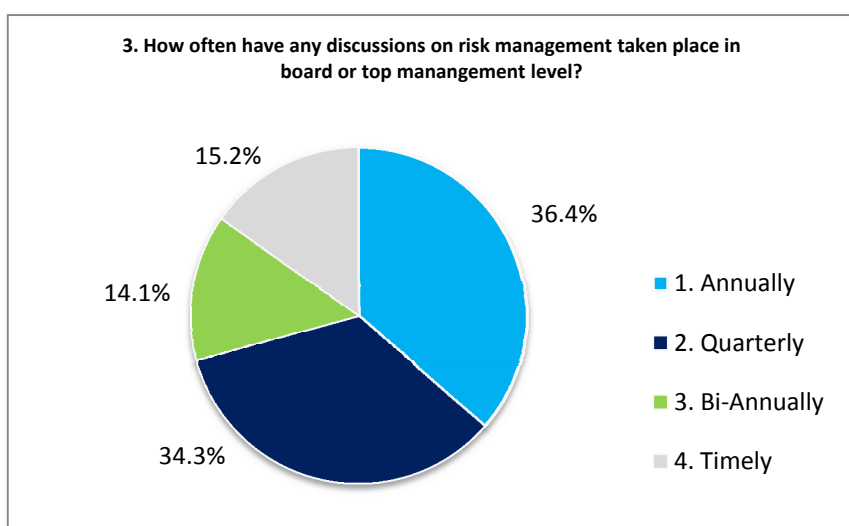


Figure 5.7 Percentage of risk management discussion in strategic planning process

5.5.1.2 Benefits of ERM

When respondents were asked about the benefits of the ERM process, all of them indicated they had seen the benefits of risk management (Q6: ERM 4).

Each firm had a different view on how they perceived the benefits of risk management, which represented the level of ERM implementation in their company. A company that has been accomplishing effective risk management is likely to have a different outlook on the benefits of ERM in preventing adverse events, as well as protecting an undesirable economic meltdown (Q6.1: ERM 5).

In Table 5.2, the majority of respondents realised that risk management helped them to manage predictable and unpredictable events, achieved business goals and aligned to strategic management. Surprisingly, only 23 respondents saw risk management as business opportunity.

Table 5.2 Benefits of Risk Management

Benefits of Risk Management	Percent	N
1. Risk Management considered critical in achieving business goal	79.0%	83
2. Risk Management identified as aligned to Strategic Management	69.5%	73
3. Risk Management makes it easier to manage a business	29.5%	31
4. Risk Management is seen as a business opportunity	21.9%	23
5. Risk Management helps the company to manage predictable and unpredictable events	85.7%	90
6. Risk Management enhances the company's general management consensus	22.9%	24
7. Risk Management enhances the company's ability to make better-informed decisions	54.3%	57
8. Risk Management enhances the company's ability to articulate and communicate risk taking to the management board and outside stakeholders	49.5%	52
9. Risk Management increases the company's management accountability	30.5%	32
10. Risk Management promotes management efficiency at all levels	49.5%	52
11. Risk Management can be used as a tool to evaluate the performance of the President & CEO	16.2%	17
12. Risk Management can prevent unwelcome surprises	69.5%	73

When ERM and RM firms are compared, there is a significant difference between the perceived benefits of risk and whether it is considered critical to achieve the business goal and performance, with a likelihood ratio statistic of 7.753 with p-value 0.005. Furthermore, there is also a significant difference between the perceived risk management of ERM and RM firms when they are aligned to strategic management, with a likelihood ratio statistic of 4.858 with p-value 0.028. There is also increased company management accountability with a likelihood ratio statistic of 5.688 with p-value 0.017. It seems that ERM companies realise the benefits of risk in terms of achieving their business objective, being aligned to strategic management and increasing their management accountability more than RM companies do.

In conclusion, from the fundamentals of the ERM analysis, some companies indicate that there is no risk management control in the company. COSO ERM is the most popular ERM framework, followed by ISO 31000. There are various forms of stated risk management in the company, but most of them are called ERM and RM. All respondents seemed to realise the benefits of risk. Most of them realised risk management was a benefit that could help them to achieve their business goal, but only some companies saw it as a business opportunity. ERM companies realised the

benefits of risk significantly more than RM companies, when it came to the achievement of their business goals, being aligned to strategic management and performance, and increasing their company’s management accountability. The strategic planning process, or any discussion about risk management, should be done at least annually and, as suggested, reviewed on a quarterly basis.

5.5.2 Evidence of ERM

The respondents were asked about them having both standard organisational documents and ERM evidence. The results of this are as follow:

5.5.2.1 Standard Organisation Document

The results in Figure 5.8 show that not all respondents had the standard organisation documents on risk management. Although 94 respondents prepared staff practice guidelines and a job manual, the result was lower than expected. Job manuals are a standard tool in human resource management that help managers to set clear expectations of employees and enable them to know the scope of their work (Noe et al., 1997). This standard organisational document is obviously needed to support a business's effective planning and control. It is suggested that all firms should prepare all of these documents.

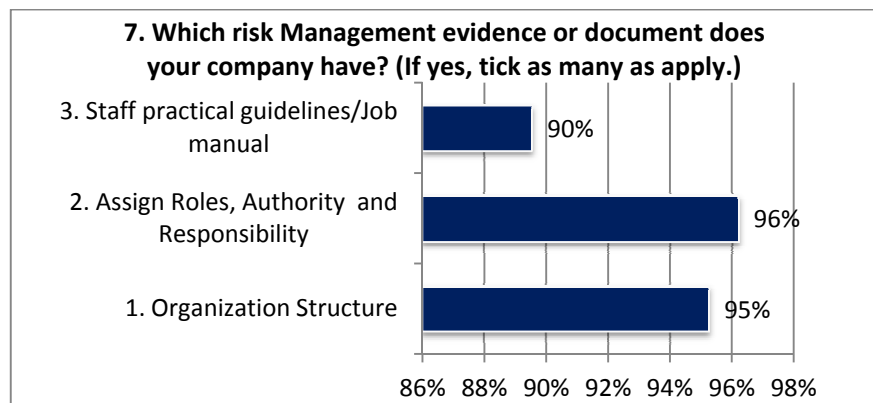


Figure 5.8 Percentage of standard organisational documents

5.5.2.2 ERM Evidence

Firms should have appropriate observable evidence to show a clear sign of effective risk management implementation (S&P, 2013). Figure 5.9 displays the evidence of the preparation (blue bar) and evidence of review (green bar). There appeared to be a lack of ERM evidence and review, especially in the case of the portfolio view of risk (50 companies prepared and 43 companies reviewed) and risk tolerance (43 companies prepared and 37 companies reviewed). Most of the listed companies (89 companies) that prepared risk management already had their policy in place. However, around 20 percent of those who had prepared a risk management policy did not have evidence of having reviewed it. Only two-thirds of the companies had risk appetite (71 companies prepared and 61 companies reviewed), a risk management framework or guidelines (71 companies prepared and 57 companies reviewed). Around half of the companies prepared the portfolio view of risk and less than half of the respondents prepared risk tolerance evidence. Interestingly, 54 companies still mentioned that their risk management system was part of their internal control policy. It could be presumed from the results that around half of the respondents carried out risk management under the internal control process.

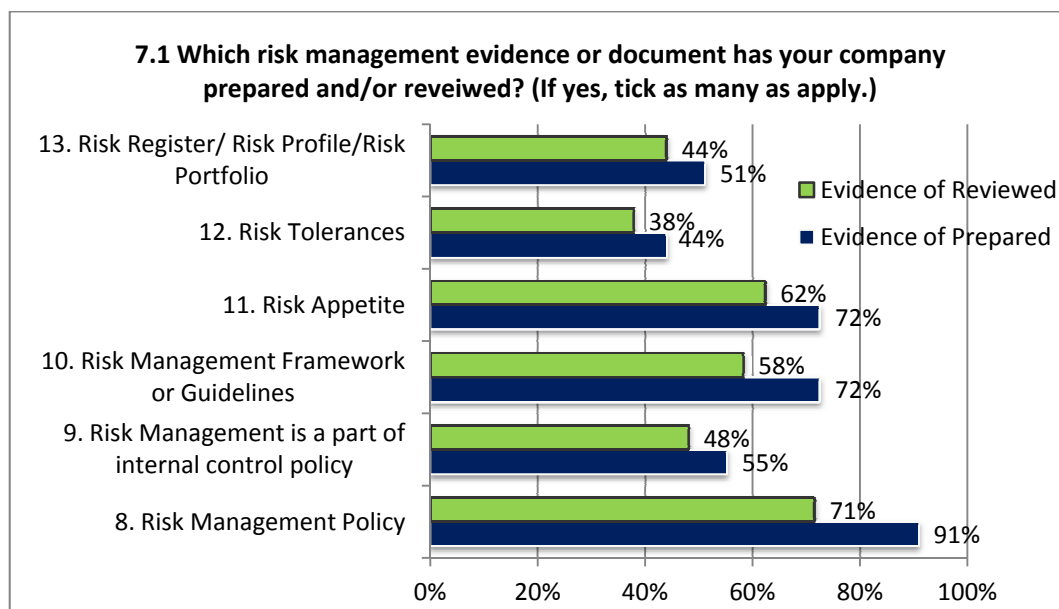


Figure 5.9 Percentage of ERM evidence

Most of the listed companies that prepared their risk management had their policy in place. However, around 20 percent of those who did prepare a risk management policy did not have evidence of reviewing it. Only two thirds of the companies had risk appetite and a risk management framework or guidelines. Around half of the companies prepared the portfolio view of risk and less than half of the respondents prepared risk tolerance evidence. Interestingly, 54 companies still mentioned that their risk management system was a part of their internal control policy. From the result, it could be presumed that around half of the respondents have risk management under the internal control process.

Figure 5.10 shows the further ERM evidence recommended by ISO (31000) and CAS (2003), e.g. a business continuity plan, crisis management and self-assessment evidence. There appears to be a lack of ERM evidence that would prevent unexpected operational risk and hazard risk. This study shows that only 69 companies of the respondents' firms prepared a business continuity plan, and around 52 companies prepared crisis management. For self-assessment evidence at both board and staff level, it was found that 58 companies had evidence of self-assessment at board level, while around one third (39 companies) had prepared self-assessment at staff level. Therefore, there should be concerns about ERM evidence.

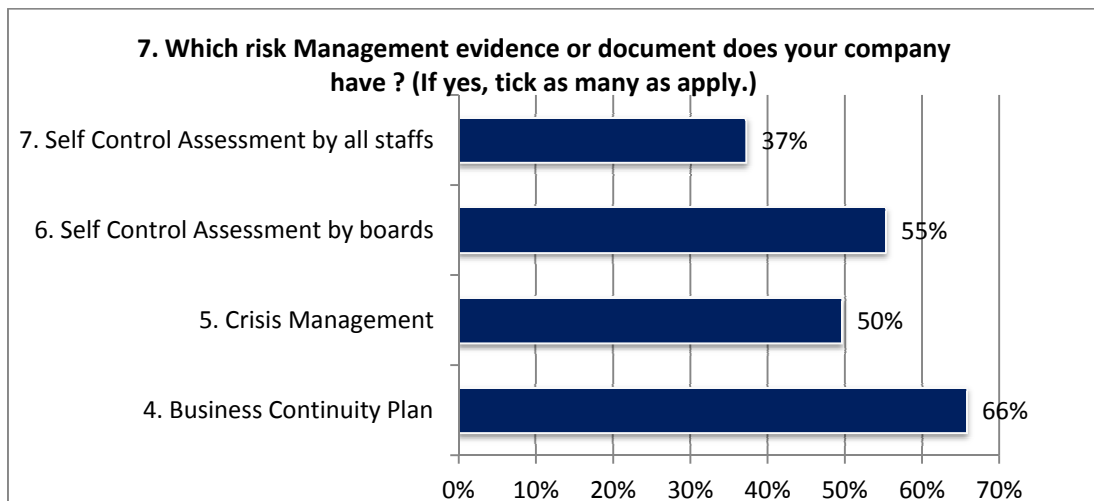


Figure 5.10 Percentage of further ERM evidence

When ERM and RM firms are compared, there are significant differences in many ERM documents, such as risk management for guidelines (likelihood ratio 9.877 and p-value 0.002), risk appetite (likelihood ratio 5.828 and p-value 0.016), risk tolerances (likelihood ratio 8.048 and p-value 0.005) and risk register (likelihood ratio 16.828 and p-value 0.000). ERM companies provided the evidence better than RM companies did.

5.5.3 Risk Management Structure and Architecture

There were questions related to risk management and the type of organisational structure of risk management the company had. These questions focused on the risk management department and risk management committee, which are both evidence of ERM implementation in the company.

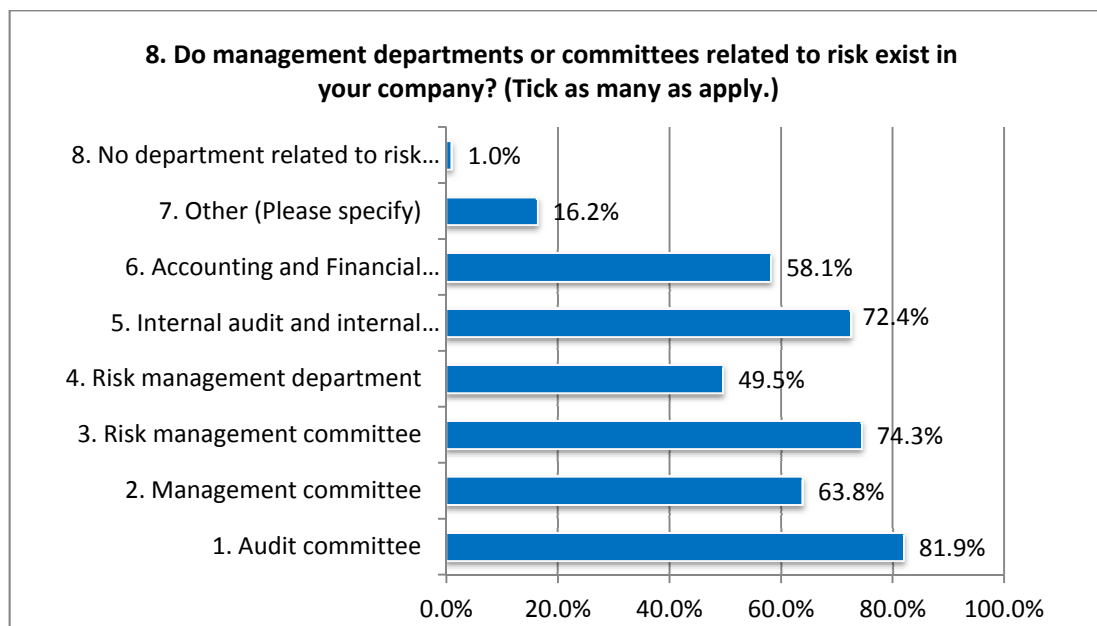


Figure 5.11 Percentage of existing risk-related departments or committees

Figure 5.11 shows the percentage of risk-related departments or committees that existed in Thai listed companies. The results can be explained in two ways. Firstly, the department that directly deals with risk management, such as a risk management committee and risk management department. Secondly, the department that indirectly manages risk, such as the audit committee, internal audit and internal

control department, accounting and financial department, management committee and audit committee.

Overall, when it comes to the department that directly manages risk, all of the companies had set up a risk-related department or committee. There was diversity in the structures, however. The majority of respondents have designated a risk management committee (Q8: ERM 20), with around half of the Thai companies having a risk management department (Q8: ERM 21). There are significant differences between ERM and RM companies on the question of whether a risk management department had been established, with a likelihood ratio statistic of 5.503 with p-value 0.019.

For departments that indirectly manage risk, the majority of respondents were related to an audit committee, with 76 companies related to an internal audit and internal control department. The other departments or committees related to risk management that the respondents mentioned included a business continuity management committee, compliance unit, quality control unit, cooperate communication unit, strategic management unit. There was no significant difference between ERM and RM companies on whether they had an audit committee, internal audit and internal control department or not.

The results of the question, "Which organisational structure of risk management does your company have?" are shown in Table 5.3 (Q9: ERM 22).

Table 5.3 Risk Management Structure

Risk Management Structure	Percent	N
1. Under risk management committee directed to the Management Committee	16.5%	17
2. Under risk management committee directed to Board of Directors	24.3%	25
3. Under Audit Committee directed to Board of Directors	25.2%	26
4. Under risk management department directed to risk management committee and Board of Directors	11.7%	12
5. Under risk management department directed to risk management committee and Board of Directors, also but need to report risk-related issues to CEO	18.4%	19
6. Under risk management department directed to Chief Executive director or management	11.7%	12
7. Under risk management department directed to Finance and Accounting Department, CEO and risk management committee, but are independent under Board of Directors	2.9%	3

8. Under internal audit and internal control department directed to audit committee and Board of Directors	11.7%	12
9. Under internal audit and internal control department directed to audit committee and Board of Directors, but need to report risk-related issues to CEO	12.6%	13
10. Under Accounting and Financial Department and reports to CEO	8.7%	9
11. Other	16.5%	17

The results show that there were various structures and types of governance of risk management in the company. The results of the companies with risk management departments could be separated into 3 main types of risk management structure.

Firstly, the respondents' most popular structure was the risk management structure. The risk management department or internal control department directly reported to the risk management committee or audit committee, and was directed to the board of directors. Around half of the respondents were in this category. The risk management structure under the audit committee (26 companies) or a risk management committee (25 companies) was also directed to the board of directors.

The second most popular structure was the independent risk management structure, which was required to regularly report their risk-related information to the CEO. There are 32 companies in the second group. 19 of these had a risk management department that reported to the risk management committee and then the board of directors, but also had to report their risk-related information to the CEO. The other 13 companies operate with an internal audit and internal control department and report to the audit committee and then to board of directors, but also need to report risk related issues to the CEO.

Thirdly, the least popular structure was the risk management department, under the managerial part of the company, such as the CEO, strategic department, management committee or top management level. This structure was less popular than the other two structures. 17 companies had a risk management structure under risk management committee directed to the management committee and 12 companies had a risk management structure with the risk management department reporting directly to the CEO or management.

5.5.4. Risk Management Policy and Risk Appetite

The majority of respondents, 96 companies had a risk management policy (Q10: ERM 23). In terms of risk appetite (Q22: ERM 29), only around 69 companies of the sample mentioned that the company had a determined risk appetite.

The respondents were questioned about what level of risk management policy their company applied (Q12: ERM 24) and Figure 5.12 shows the level of applied risk management policy. The results were satisfactory with around 73 companies having applied a risk management policy across the enterprise at every level and unit. There were significant differences between the ERM and RM firms as to the level that the company applied risk management policy, with the likelihood ratio statistic equal 9.604 with a p-value of 0.008. The ERM companies performed better than the RM companies.

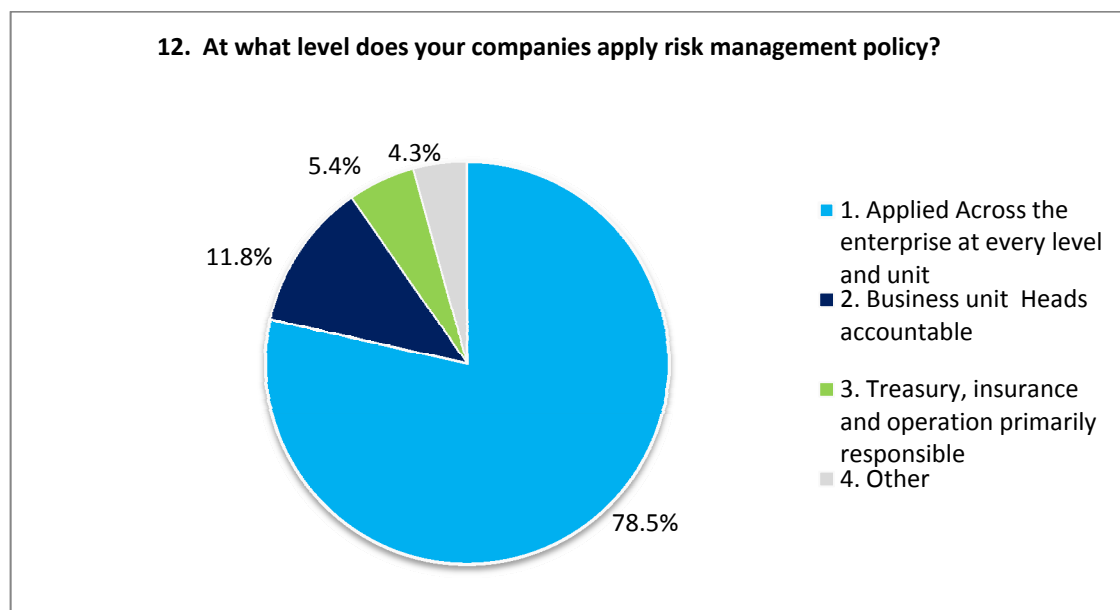


Figure 5.12 Percentage of the level applied risk management policy

There were various responses to the question about who took the primary decision and who was responsible for identifying the review and monitoring of risk management policy. Table 5.4 shows the result of the respondents. The risk management committee were the most responsible and monitored risk management policy over the board of directors. The risk management department was the main department who prepared the risk management policy. For the reviewing process, the audit committee, internal audit department and risk management committee had been chosen.

Table 5.4 Risk Management Policy Responsibility

Risk Management Policy Responsibility	Responsible by (N)	Prepared by (N)	Monitoring by (N)	Reviewed by (N)
1. Board of Directors	34	2	25	34
2. CEO	26	4	25	23
3. Top Management	31	16	22	19
4. Management Committee	25	9	18	18
5. Risk Management Committee	41	29	45	42
6. Audit Committee	13	8	30	46
7. Chief Risk Officer	20	20	20	18
8. Chief Finance Officer	12	11	12	14
9. Chief Internal Officer	12	8	21	14
10. Risk Management Department	21	46	37	24
11. Internal Audit Department	10	11	30	42
12. Each Departments and business units	27	30	25	16

Figure 5.13 shows the percentage of how often the company reviewed risk management policy. Risk management policy should be continuously improved and updated at least once a year (ISO, 2009). Most of the respondents (48 companies) had reviewed their risk management policy annually. 20 companies reviewed quarterly, 6 companies reviewed twice a year, 9 companies had reviewed it in a timely manner and 8 reviewed relevant new legislation or standard changes.

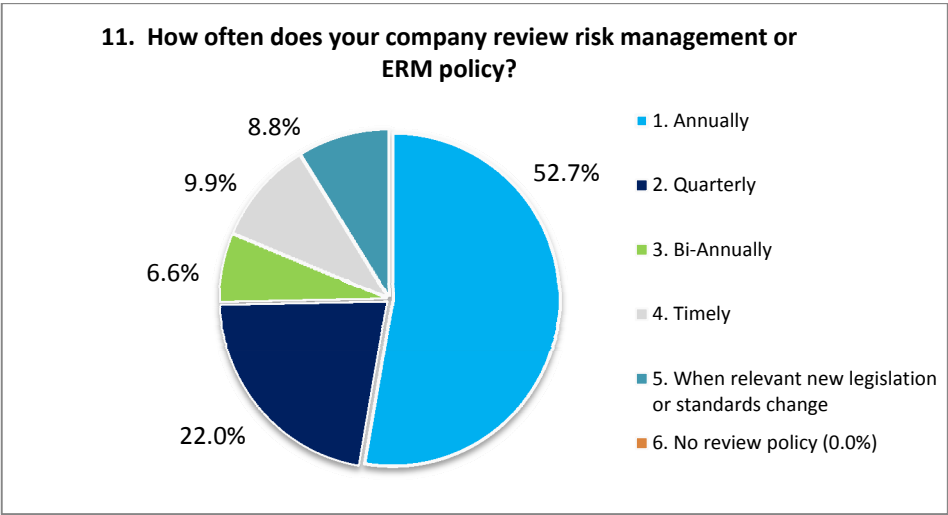


Figure 5.13 Percentage of how often the company reviewed risk management policy

Figure 5.14 shows the percentage of how often the company reviewed risk management appetite. While 66 respondents had reviewed risk appetite, 26 respondents reviewed it annually. 30 companies reviewed it quarterly, 2 reviewed it twice a year, 7 reviewed it in a timely manner.

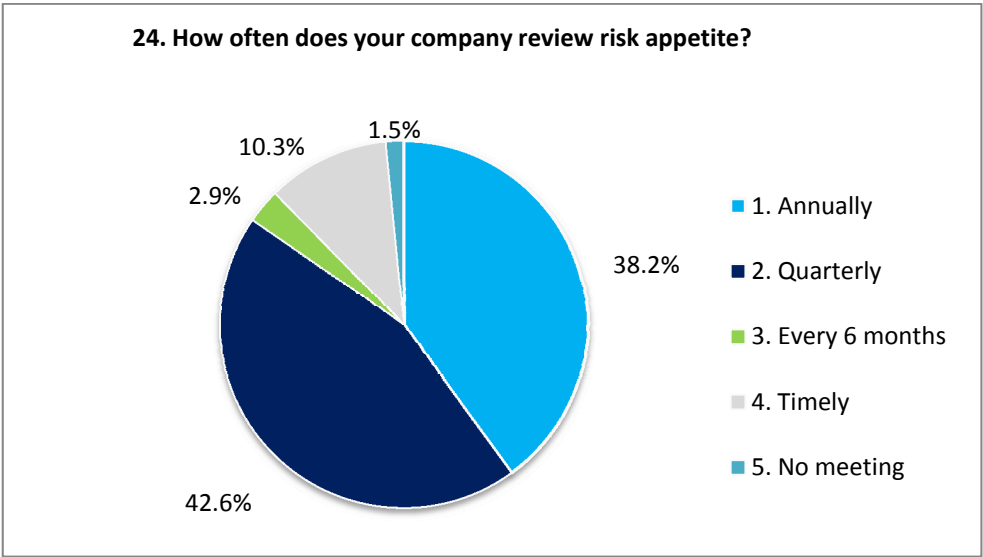


Figure 5.14 Percentage of how often the company reviewed risk appetite

5.5.5 Responsibility/Accountability

Figure 5.15 shows the percentage of how often the board of directors had discussed or received reports on risk management (Q13: ERM 25). The majority of respondents (56 companies) had quarterly meetings at the board of directors' level and the second 17 companies had yearly discussions. The majority of our sample had at least quarterly discussions or received reports on risk management at the board of directors' level.

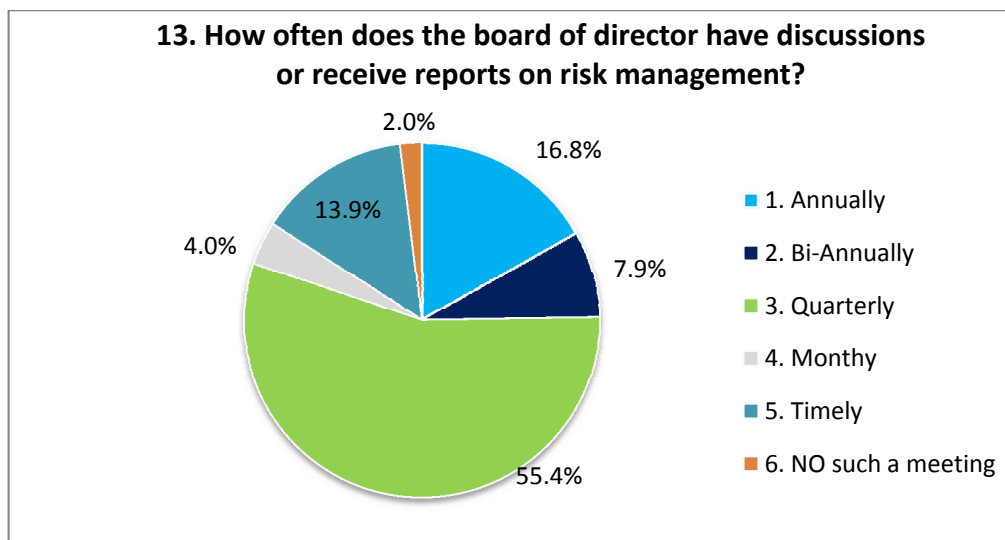


Figure 5.15 Percentage of how often risk management discussions take place

Next was the question about who was primarily responsible for the overall risk management process, and so coordinate it, and who is responsible for certain activities of the risk functions at the company's entity level. The respondents were allowed to choose as many of the options as they liked that applied to the answer. The answer on responsible and participating staff is shown in Table 5.5.

Table 5.5 Frequencies of the people who are primarily responsible and participate in the overall risk management process

Related parties	Responsible by (N)	Participate by (N)
1. Entity Level/Across the company	40	58
2. Board of Directors	54	33
3. CEO	58	34
4. Top Management	58	37
5. Management Committee	52	33
6. Risk Management Committee	61	31
7. Audit Committee	39	41
8. Chief Risk Officer	32	19
9. Chief Finance Officer	31	46
10. Chief Internal Officer	30	37
11. Risk Management Department	37	31
12. Internal Audit Department	31	53
13. Each Department and business units	40	54
14. Other	2	2

The majority, 61 companies, mentioned that the risk management committee was responsible (ERM, 27) for the overall risk management process and 54 companies selected the board of directors (Q20: ERM 26). The respondents perceived the people responsible for ERM as the risk management committee, rather than the board of directors.

As is shown in Table 5.6, there were 49 respondents that did not select the board of directors as being responsible for risk management, and 26 respondents did not select either the risk management committee or board of directors. Amongst the 61 companies that chose the risk management committee, 28 companies selected both the risk management committee and the board of directors, and the rest of the 23 companies selected only the risk management committee without the board of directors.

Table 5.6 Contingency between the risk management committee and board of directors responsible for risk management

Responsible by		Risk Management Committee		Total
		Non Responsible	Responsible	
Board of Directors	Non Responsible	26	23	49
	Responsible	16	38	54
Total		42	61	103

As this survey shows, there can be a conflict of responsibility between those responsible for risk. The board might think that the responsibility is with the risk management committee and not themselves. Yet it is supposed that under ERM, the board of directors has the final responsibility and ownership of the oversight of risk management (COSO, 2004, AON, 2010, Chapman, 2011, S&P, 2013, Deloitte, 2009). The appropriate dedicated risk management roles (KPMG, 2010) for risk leadership was assigned to the CRO (Mikes, 2010, Aabo et al., 2005, Gates, 2006) or the risk management committee (AON, 2010). The risk management committee can be established as a sub-committee of the board and have primary responsibility for the ERM programme, and directly report to the board in order to facilitate and provide thoughtful risk management oversight at board level discussions (Hume, 2010). However, the risk management committee should not have final responsibility for the ERM; only the board of directors should have this. As a result of the problem that has been mentioned, this study proposes the responsibility and accountability of the ERM stakeholder, as shown below in Table 5.7 and Figure 5.16.

Table 5.7 shows the mechanisms of the responsibility and accountability of ERM stakeholders. The board of directors, acting as the direct agent for the shareholders, as well as stakeholders or principles, is supposed to make decisions that will enhance firm performance. It is essential to have clear lines of risk ownership, from the board through to management level and then on to operational level. The functions of the three lines are referred to as direct level, control level and operation level. These should preferably should be performed by separate individuals in the enterprise where the business is operated, regulated and control.

Table 5.7 The responsibility and accountability of ERM stakeholders

Principle	Agent		
	1. Direct (D)	2. Control (C)	3. Operation (O)
Stakeholders Shareholders (Value Creation)	Board of directors	Risk Management Committee Audit Committee	Manager
		Chief Executive Office Chairman C-Suite (CRO, CFO) Top Management	All employees across all levels
		Risk Management Dept Internal Audit Dept	Each Department and business unit: - Sales - Procurement /Purchase - Marketing - Operation - IT/IS - Finance and accounting

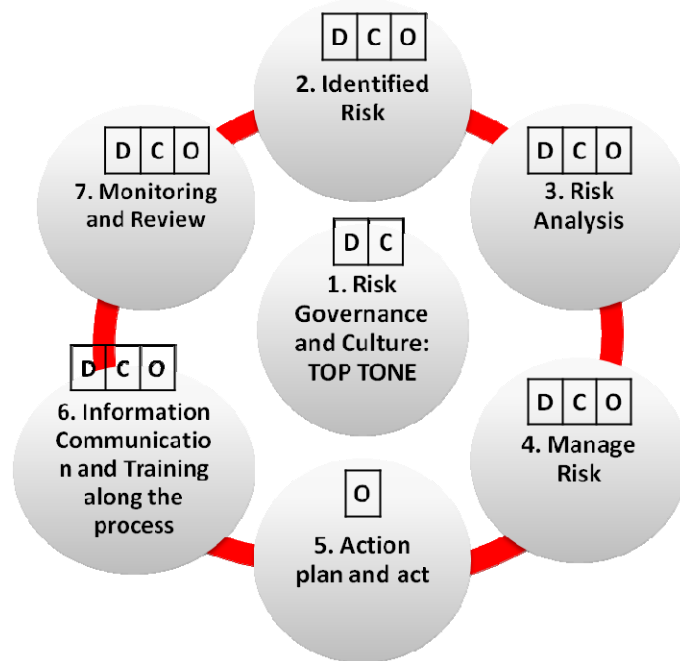


Figure 5.16 Overall risk management responsibility and accountability

Figure 5.16 shows both the overall risk management responsibility and accountability that exist in risk management processes. There are seven risk management processes to manage risk, including 1) risk governance and culture, 2) identified risk, 3) risk analysis, 4) manage risk, 5) action plan, 6) information and training along the process and 7) monitoring and review. For risk governance and culture, the board of directors has full responsibility for considering the risk governance structure, embedding the risk culture, oversight responsibility and ensuring that the risk management system is effective. The management establishes – with board oversight – the structures, reporting lines and appropriate responsibility and authority. The board of directors may be assigned a risk management committee or audit committee, and move down to the risk management department and internal audit department to review, monitor and recommend to the board that the Company's risks are being effectively managed. In an enterprise, responsibilities and practices are assigned and executed by the board of directors, executive management and all individuals across all levels.

The risk identified process, risk analysis and manage risk process relate to all parties. All individuals are involved in identifying their own risks, and management representatives from each department participate with top management in the identification and analysis process, at both department and entity level. The overall risk is captured in the risk register and then managed within risk appetite. The risk owner and risk manager should be identified. For the action plan and act process, all individuals should know their roles and accountability to the risk management process, as well as contribute to achieving the company's objective. The policies and practices reflect the expectations of competence. The overall risk management process should be reviewed by the risk management department and monitored by the risk management committee before approval is given by the board of directors.

5.5.6 Risk Management Process

The questions about the risk management process come from the generalised framework of the ERM. This includes identifying and controlling risk, effective communication throughout the firm, and having training and knowledge development for the management of staff at all levels, adequate technology and information systems, to support the risk management system and monitor risk management on a timely basis.

5.5.6.1 Identifying and Managing Risk

Table 5.8 shows the results of identifying and managing risk. Strategic risk and reputation risk are two of the main types of risk in ERM (Chapman (2011)). The results of this study show that around two third of the companies identified strategic risk and reputational risk (Q27-28: ERM 30-31). Most of the companies identified market risk, business risk and operation risk, which is a common type of risk in running businesses.

Table 5.8 Identifying and managing types of risk

Risk	Responses	Percent of Identify Cases
Market risk	81	82.70%
Business/Industry risk	75	76.50%
Operational risk	75	76.50%
Strategic risk	69	70.40%
Economic risk	68	69.40%
Reputational Risk	65	66.30%
Compliance risk	64	65.30%
Financial risk	62	63.30%
Liquidity risk	62	63.30%
Natural and Man-made Hazards risk	61	62.20%
Political risk	58	59.20%
Interest rate risk	57	58.20%
Foreign exchange risk	56	57.10%
Credit risk	52	53.10%
Informational Risk	40	40.80%
Reporting risk	37	37.80%
Capital management	36	36.70%
Equity price risk	28	28.60%
Capital Adequacy Risk	13	13.30%
Other	2	2.00%

Furthermore, Figure 5.17 shows the various ways to manage reputational risk. The majority of respondents had a Corporate Social Responsibility Scheme, which is a channel to respond to customer complaints and to develop good corporate governance systems. Whilst only 27 companies were concerned about credit rating from a rating service company. The results can be explained by the way that companies have integrated the many techniques which can be used in managing reputation risk to enhance their reputation, especially to external stakeholders.

In terms of the process to identify risk, Figure 5.18 shows that around two-thirds of the sample used a top management brainstorming approach and around half of the sample used facilitated workshops in cross-sectional groups. Additionally, focusing on the technique was used to evaluate risk mitigation, risk map/risk matrix was the most popular technique amongst the respondents, as the results show in Figure 5.19.



Figure 5.17 Managing reputational risk

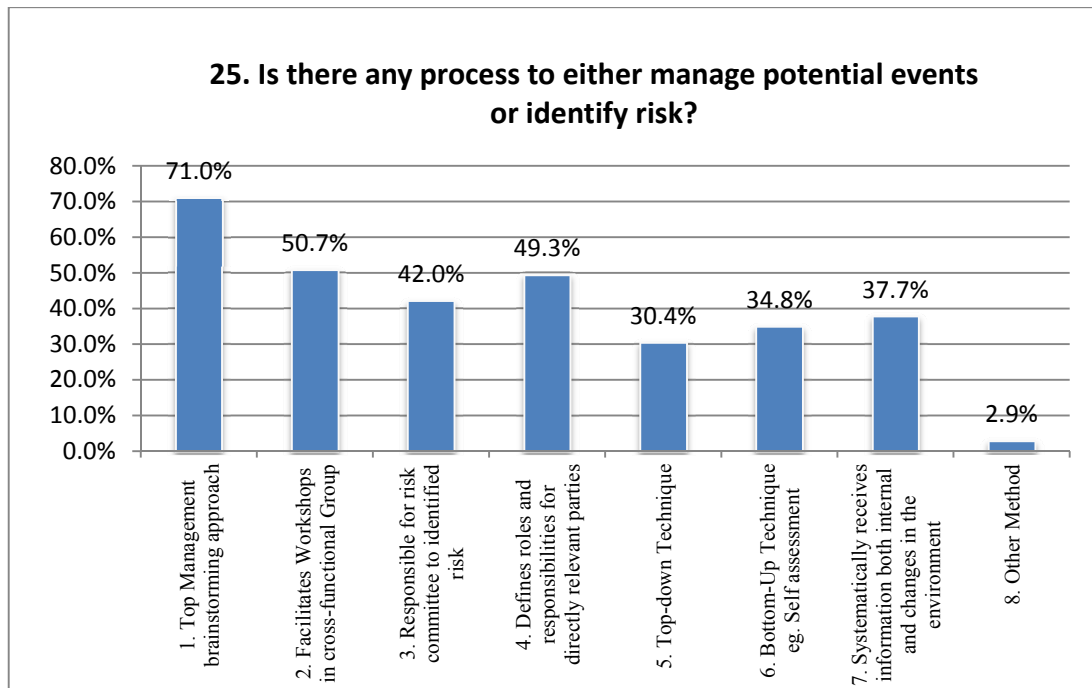


Figure 5.18 Percentage of various techniques in risk identification and risk assessment

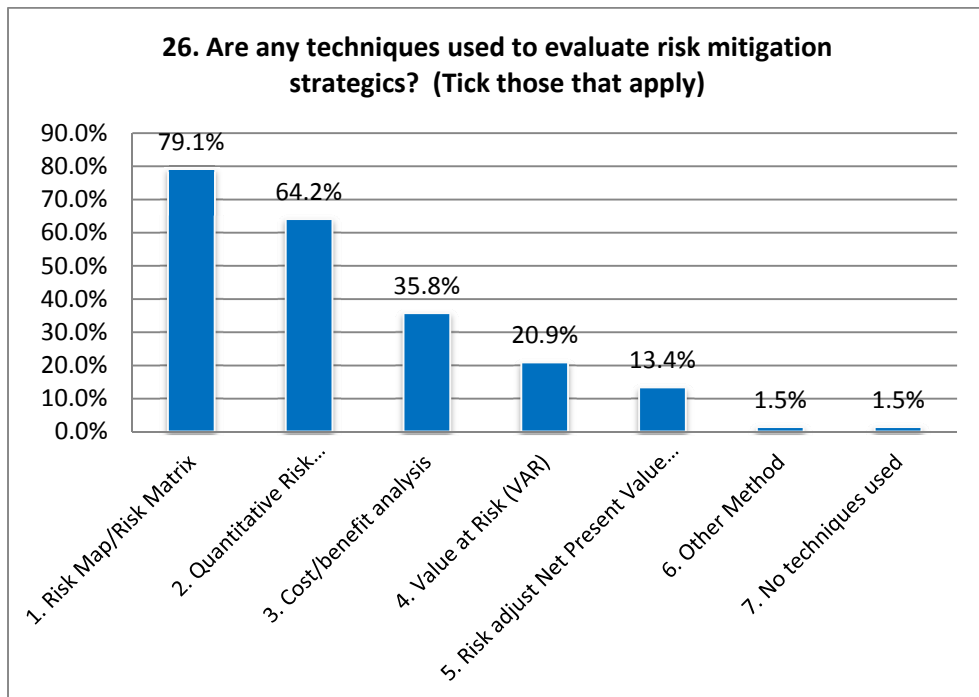


Figure 5.19 Percentage of various techniques used to evaluate risk

5.5.6.2 Communication

Most companies were satisfied with their risk communication system. 84 respondents said they had clear documents or standards for risk taking and risk management that were widely understood within the company (Q29: ERM 32), and 92 respondents said there was clear communication with the senior manager or people responsible in the company about their expectations for risk taking (Q30: ERM 33).

Table 5.9 Channel of risk communication

Channel of risk communication	N	Percent
1. Risk management as a cooperate culture	66	67.30%
2. Fully communicated and acknowledged policy and procedure	63	64.30%
3. Policies and procedures in writing	67	68.40%
4. Clearly stated in the functional job descriptions or job manual of all units	48	49.00%
5. Everyone need to sign their understand and acknowledge	13	13.30%
6. Self-assessment of employees	11	11.20%
7. Self-assessment of directors	17	17.30%
8. Whistle-blower system and complaints	28	28.60%
9. Having Investor relation centre (Stakeholder)	39	39.80%
10. Disclosed in company website (Stakeholder)	47	48.00%
11. Disclosed in Annual report in English (Stakeholder)	61	62.20%
12. Other Method	4	4.10%

Table 5.9 shows the results of the question about what the channel of risk communication is throughout the company (Q31: ERM 34), which can be divided into internal and external channels. The results were not as high as expected. Three main communication channels for internal risk communication were risk management policies and procedures in writing, risk management as a corporate culture and well communicated and acknowledged policy and procedures. Less than one third of respondents were concerned about a whistle-blower system, self-assessment and signed risk acknowledgements. For external risk communication channel, there was a lower response than expected. Three main communication channels had an investor relation centre and provided disclosure on the company website and in the annual report in English.

5.5.6.3 Training and Development

Figure 5.20 shows the results of the training programmes that are offered to directors and staff. Amongst the listed companies in this sample, both 55 companies (55.6 percent) directors and staff had been on training programmes, but only 32 companies (32.3 percent) gave directors a risk management training programme (Q32: ERM 35) and just 20 companies (20.2 percent) gave it to staff (Q33: ERM 36). The result appears to indicate that more risk management training should be considered in the companies.

There were significant differences between the ERM and RM firms when it came to risk management training programmes being given to directors, with a likelihood ratio statistic of 13.785 with a p-value of 0.001, and risk management training programme given to staff, with a likelihood ratio statistic of 12.395 with a p-value of 0.002. The ERM companies had better training programmes than RM companies.

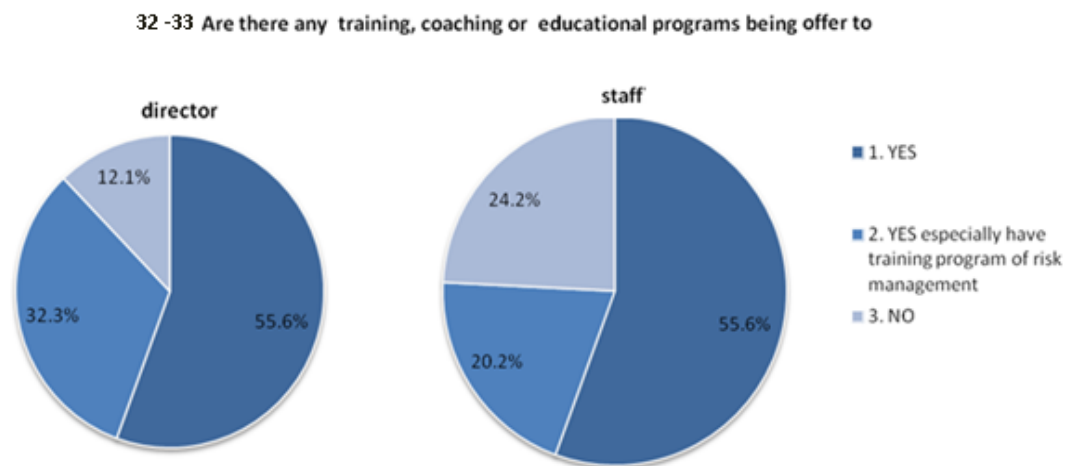


Figure 5.20 Percentage of training programmes offering to directors and staff

5.5.6.4 Information System and Information Technology

Figure 5.21 shows the results of the question about the existence of risk management information systems in the company. Only around half of the respondents provided adequate information system to enable people to identify, assess and respond to risk (Q34: ERM 37). Nevertheless, there were significant difference between ERM and

RM companies when it came to the existence of risk information systems, with a likelihood ratio statistic of 5.287, with p-value 0.021. ERM companies had a better risk management system than RM companies.

Figure 5.22 shows the percentage of the different types of risk management information system that existed in the companies. The result was not as high as expected. 65 companies mentioned that they had IT recovery and a back-up plan or disaster recovery plan. Only 38 companies claimed that they had effective technology and information system and only 27 companies had a risk management information system. COSO (2004) pointed out that technology is a critical part in facilitating the flow of information that is directly linked to supporting the ERM program; and also stated that the appropriate selection of IS infrastructure and technology range are critical in supporting the company's strategy and achieving company's objective. Listed companies in Thailand should be concerned about improving their risk information system.

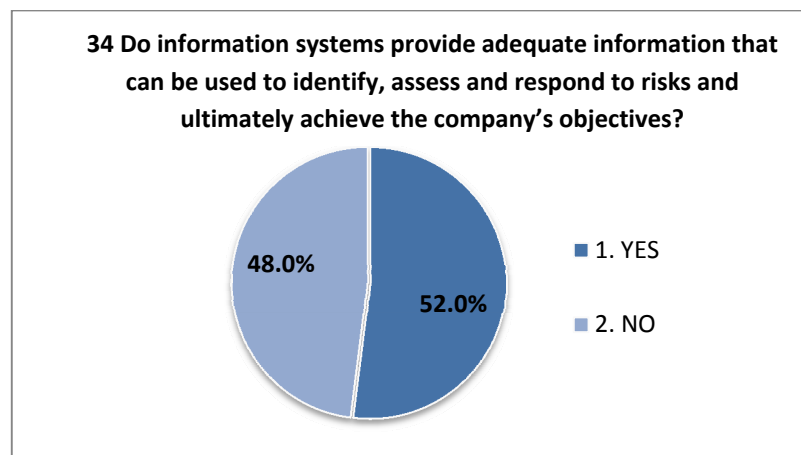


Figure 5.21 The adequacy of risk management information systems

35 Which risk management information system or infrastructures do you use in your company? (Tick all those that apply)

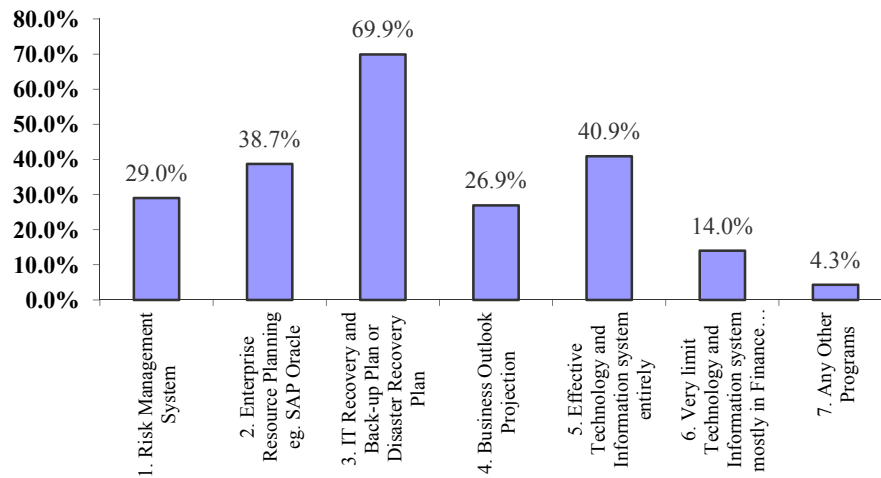


Figure 5.22 Percentage of risk management information systems

5.5.6.5 Monitoring

All the companies should have an ongoing risk monitoring system and assign a person responsible for monitoring risks across the enterprise closely (AON, 2010) in order to develop a successful ERM programme of top-tier practitioners. Figure 5.23 shows that the vast majority of respondents had assigned a person who was primary responsible for monitoring overall risk management on a timely basis (Q37: ERM, 38). Companies are clearly concerned about the ongoing risk monitoring process.

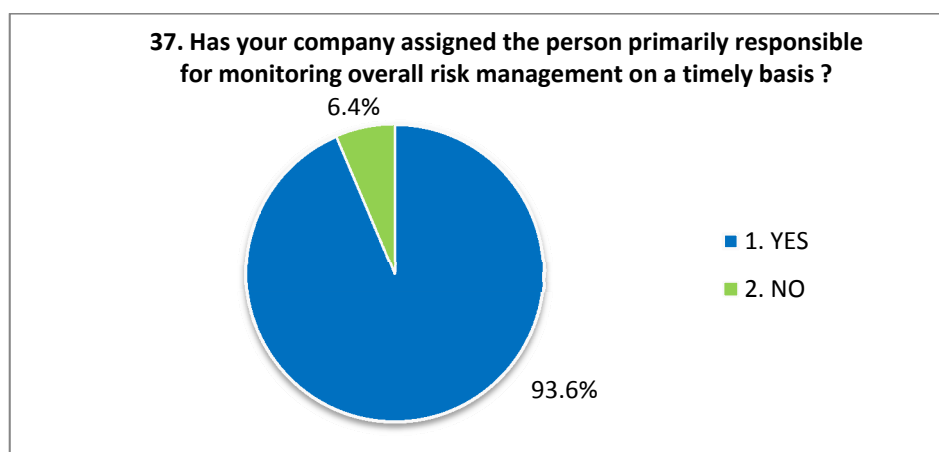


Figure 5.23 Percentage of risk monitoring

The results of the question of which technique or method a company uses to monitor risk management (Q38: ERM 39) are shown in Figure 5.24. The three main monitoring techniques are an enterprise performance appraisal, a standard operational performance and financial ratio, and a balanced scorecards and Key Performance Indicators. These results are linked to performance measurements in various ways. Only a few companies applied early warning indications and benchmarked then against policy or best practice.

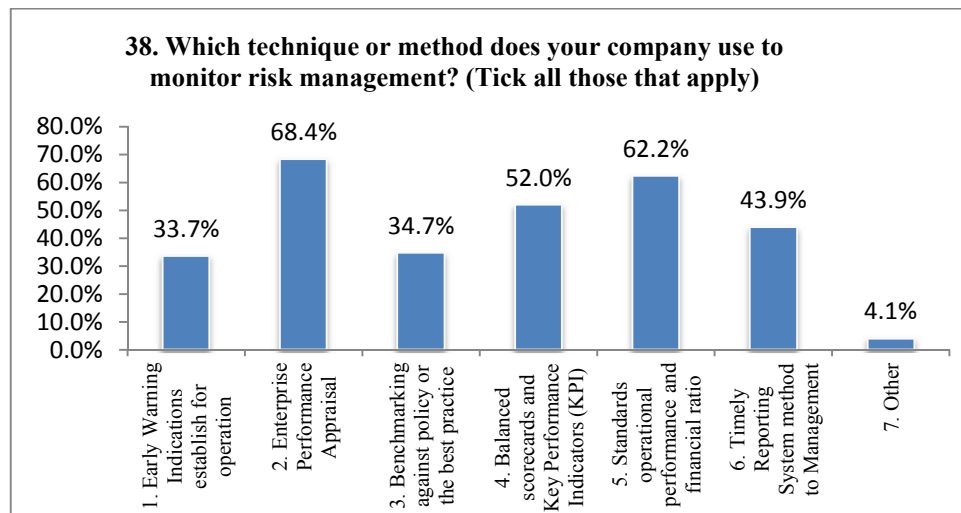


Figure 5.24 Percentage of techniques used in monitoring risk management

5.6 Conclusion

In today's turbulent and complex market, businesses have made considerable changes to mitigate the weaknesses of traditional risk management and made the required improvements that are continually needed in order to ensure that risk management can function. To gain a comprehensive and a holistic view of all the risks the companies perceive, and how they manage risks within their appetites, there has been an increasing interest in implementing ERM programmes that have been exposed by the financial crisis. The survey showed how immature the current stage of risk management is in some of Thailand's enterprises. Some companies indicate they have no risk management control, and only one third of respondents indicated that they use "enterprise risk management" and more than half of the sample appeared to be in the level of "risk management".

The survey indicated that all respondents seemed to realise the benefits of risk management. However, there are different levels of perceived benefits of risk. Most of the companies realised that risk management can help to manage both predictable and unpredictable events. Fewer identified that risk management has benefits in achieving business goals and only a few respondents (23 companies) perceived a business opportunity, which is one of the main leverages from the "silo" risk management to holistic approach. Around one third of the companies did not identify and manage strategic risk. In addition, when it came to the strategic planning process and discussion about risk management, companies gave importance to top management. However, the board of directors should be involved in this process of discussing the organisation's key risk exposures, in order to provide the underlying basis for the discussion.

There appears to be a lack of risk management evidence and review processes when it comes to the risk management evidence. The survey showed that when it came to the general organisational evidence, such as organisational structure, assigned roles and authority and responsibility, etc., most of the companies had all the expected documents. Just under half of the companies in this survey had risk tolerances, a risk register, crisis management and self-control assessment by all their staff. Only two thirds of the companies had risk appetite and a risk management framework or guidelines. The results also shows that some companies do not review these documents, which is one of the most important features required to maintain an effective risk management system. These findings revealed a lack of risk evidence that is attributable to insufficient risk management implementation in the company.

Around half of the companies had separate risk management as a department, while the rest still had their structure under internal control and internal audit. Around two third of the companies established a risk management committee and around half of the companies established a risk management department. These findings show that the companies may desire a more robust ERM implementation to go beyond the existing risk management function within the company (e.g. internal audit, insurance, accounting and finance, etc.).

The results reveal that many companies might not perceive that the role of risk management should be the responsibility of the board of directors, but see it as being related to the risk management committee or top management instead. When the risk management committee was responsible for risk management process, the board of directors seemed less responsible. In fact, it is the board of directors who are the key figures in influencing effective risk management and the oversight of risk is their responsibility. Therefore, it could be suggested that the board of directors have the most prominent role and the biggest responsibilities in the ERM programme.

For the risk management process, identifying and managing risk, the communication process, training programme about risk awareness/management, information system and monitoring are all important in order to gain effective ERM implementation. There are some issues that could be addressed, especially risk management training and the development and existence of risk information systems, were significantly lower than expected. Around one third had given risk management training to the top management level and only around 20 percent had such a training programme. Around half of the companies in the sample did not provide adequate information systems.

Given these concerns, there may be opportunities for Thai listed companies to consider the components of ERM suggested in this study. This could help to develop and enhance a more effective risk management systems to sustain their business in the long run.

Chapter Six

Enterprise Risk Management Scoring Method

6.1 Introduction

A major issue for ERM implementation is the lack of one universally accepted conceptual ERM framework. Without such a framework, it is difficult to measure the level of ERM implementation. Recent researchers (e.g. Kraus and Lehner, 2012, Mikes and Kaplan, 2013, Fraser and Simkins, 2010) have questioned ERM measurement. This has led to the conclusion that previous studies have so far failed to both tackle and investigate ERM's actual contribution. Most of these previous ERM studies used information that was publicly available to evaluate ERM practice, such as 10-K's, proxy statements, company's annual report and the company website. For example, prior research (e.g. Hoyt and Liebenberg, 2011, Eckles et al., 2014, Beasley et al., 2008, Pagach and Warr, 2010, Tahir and Razali, 2011) used keywords as a proxy for ERM. Yet these did not address the particulars of ERM practice and the differences in the ERM stages between firms. Hence, there is a need for an appropriate method of assessing ERM implementation.

The objective of this chapter is to propose a method of measuring ERM implementation that standardises contributions. The Thai survey data is used to test the proposed ERM measuring model. To do this the simple proposed ERM Scoring method is compared to three different statistical approaches; cluster analysis, principal components analysis (PCA) and partial least square analysis (PLS). Their performances in terms of prediction are considered.

The chapter is structured as follows. The next section explores whether the sample suffers from common method bias. This is followed by descriptions of the alternative assessment methods. Initially, the proposed simple method is developed, then in turn ERM Clustering, ERM PCA and the ERM PLS model. The subsequent section explores the comparison of these alternative methods. Analysis of individual components by the level of ERM Scoring is provided. Finally, there is a conclusion.

6.2 Checking for Selection Bias

One problem that can arise from sampling is selection bias, especially common method bias, see Podsakoff et al. (2003). From a total of 456 listed companies, a sample of 87 companies was drawn for analysis. Therefore, it is important to test whether there is a selection bias in the sample before exploring the proposed model. If no evidence of a non-response bias is found, it can be assumed that the sample will not lead to erroneous conclusions when the data is further analysed.

The Heckman model was within the ERM context and involves two equations models, which are:

1. A regression equation is considered with the outcome variable, in this case the ERM Scoring variable, as represented, the regression equation being $\mathbf{ERM} = \boldsymbol{\beta}'\mathbf{X} + \boldsymbol{\varepsilon}$, where \mathbf{ERM} represents the vector of ERM scores and \mathbf{X} the matrix of observed variables. $\boldsymbol{\beta}$ is vector of coefficients for the variables and $\boldsymbol{\varepsilon}$ is an error vector. The significant determinants of ERM in this case was taken to be the company's size (size), market volatility (market) and economic factors (econ). So, for an observation value, the regression variable will be taken to be:

$$ERM_i = \beta_0 + \beta_1 size_i + \beta_2 market_i + \beta_3 econ_i.$$

2. To test for selection bias, both the collected sample (uncensored) and those that are not included in the sample (censored) are considered. The sample selection equation is considered a portion of the sample, whose outcome variable was observed, and then mechanisms were used to determine the selection process. The additional explanatory variables and the variable from equation of interest are variables in selection equation. ERM is observed if $Z_i\gamma = (\gamma_0 + \gamma_1 size_i + \gamma_2 market_i + \gamma_3 econ_i + \gamma_4 total_assets_i + \gamma_5 net_profit_i)$. The selection equation is:

$$ERM^* = Z_i\gamma + u_i$$

where ERM^* is observed for the population as a whole from all the listed companies, including the response and non-response sample, which was defined as $ERM=1$ if $ERM^* > 0$ and $ERM=0$, if $ERM^* \leq 0$ otherwise.

The probit regression can be formed as:

$$\text{Prob}(\text{ERM}_i = 1 | Z_i) = \Phi(Z_i\gamma) \text{ and}$$

$$\text{Prob}(\text{ERM}_i = 0 | Z_i) = 1 - \Phi(Z_i\gamma)$$

Z_i is a vector of explanatory variables that determines the section outcome of ERM*; Φ is the standard normal cumulative distribution function.

ε and u are the error terms of these two regression equations, and assumed to be bivariate normal with a mean 0. Variances are as indicated and the error terms are correlated where $\rho_{\varepsilon u}$ indicates the correlation coefficient. λ_i is the inverse mills ratio and is evaluated at $Z_i\gamma$ and (ε_i, u_i) is independent of \mathbf{X} and \mathbf{Z} . The error terms are independent of both sets of explanatory variables.

The assumptions of the Heckman model are: $(\varepsilon_i, u_i) \sim MN(\mu, \varepsilon)$

$$\text{where } \mu = (0,0) \text{ and } \varepsilon = \begin{pmatrix} \sigma_\varepsilon^2 & \rho^{\sigma_\varepsilon\sigma_u} \\ \rho^{\sigma_\varepsilon\sigma_u} & \sigma_u^2 \end{pmatrix}$$

Finally, the conditional expectation of ERM given is:

$$E[(\text{ERM} | X, \text{ERM}^* = 1)] = \beta X_i + E[u_i | X, \text{ERM}^* = 1]$$

under the assumption that the error terms are jointly normal as the assumption:

$$E[(\text{ERM} | X, \text{ERM}^* = 1)] = \beta X_i + \rho\sigma_u \lambda_i(Z_i\gamma)$$

When ρ and λ equal 0, OLS regression provides unbiased estimates, otherwise it is biased.

The result is shown in Table 6.1. Since σ (sigma) is more than 0, ρ (rho) and λ (Lambda) were not significantly different from zero testing at 5% level of significance. Hence, there did not appear to be any selection bias in the sample.

Table 6.1 Heckman model

SURVEY87	Freq.	Percent	Cum.
0	369	80.92	80.92
1	87	19.08	100.00
Total	456	100.00	

Heckman selection model
(regression model with sample selection)

Number of obs = 425
Censored obs = 338
Uncensored obs = 87

Log likelihood = -339.3283

wald chi2(3) = 10.46
Prob > chi2 = 0.0150

	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
erm score						
size	.6740881	.2668834	2.53	0.012	.1510063	1.19717
market	-.6037365	.5971656	-1.01	0.312	-1.77416	.5666865
econ	5.856844	2.851198	2.05	0.040	.2685994	11.44509
_cons	-1.164129	2.713129	-0.43	0.668	-6.481764	4.153506
survey87						
size	.3152539	.118907	2.65	0.008	.0822005	.5483073
market	-.1168262	.3594736	-0.32	0.745	-.8213816	.5877292
econ	1.306035	1.492908	0.87	0.382	-1.62001	4.23208
total_assets	2.69e-10	4.56e-10	0.59	0.556	-6.26e-10	1.16e-09
net_profit	1.05e-08	1.53e-08	0.69	0.493	-1.94e-08	4.04e-08
_cons	-2.996137	.8060257	-3.72	0.000	-4.575918	-1.416355
/athrho						
/lnsigma	-.0623451	.6064079	-0.10	0.918	-1.250883	1.126192
	.147553	.0810407	1.82	0.069	-.0112838	.3063897
rho						
sigma	-.0622644	.6040569			-.848531	.8097121
lambda	1.158995	.0939257			.9887796	1.358512
	-.0721641	.7021875			-1.448426	1.304098
LR test of indep. eqns. (rho = 0): chi2(1) = 0.01 Prob > chi2 = 0.9171						

6.3 ERM Scoring

The first method proposed in the study to measure ERM implementation is the ERM Scoring method, which is based on 40 components as described in Chapter 4. A simple methodology was used to develop the first measure of ERM implementation.

ERM Scoring can be calculated by summing the 40 components, from scores on an interval-scale variable. The sum is then converted into 5 ERM categories that indicate the status of ERM implementation from limited ERM implementation to full ERM implementation. Table 6.2 shows the ERM Scoring description by scale. The ERM raw-score ranges from 0 to 8 and is defined as 1 categories means no or weak risk management. These categories show there is a lack of a reliable control system and inadequate risk management system in the firms. The ERM raw-score is greater than 8 and less than 16, and is defined as 2 categories means there is risk management, but it is unlikely to contain many of the necessary element of ERM. It could indicate that the management of risks in silos and with little coordinating of risks across the firm, which is considered the traditional risk management system. The ERM raw-score is greater than 16 and less than 24 and defined as 3 categories, which means ERM implementation is starting. There are indications of ERM implementation in the company, but they do not reach the level that could be described as ERM. The ERM raw-score is greater than 24 and less than 32, and is defined as 4 categories, which means ERM standard has been achieved and the main components of ERM have been covered by the company. An ERM raw-score that is greater than 32 to 40 is defined as 5 categories, which means effective ERM and most of the components of ERM are included.

Table 6.2 ERM score description by scale

ERM Scoring	RAW SCORE (X)	ASSESSMENT	EXPLANATION
1	$0 \leq X \leq 8$	No or weak risk management level	This stage shows that the signal lacks a reliable control system and it is an inadequate risk management system in the firms
2	$8 < X \leq 16$	Risk management level	Considered as a traditional risk management system level: there is no gathering of all risks across the firm, so risks are still managed in silos
3	$16 < X \leq 24$	Start of ERM implementation level	Indication of the start of ERM implementation in the company, but not reaching ERM standard
4	$24 < X \leq 32$	ERM standard level	Main components of ERM have been covered in the company
5	$32 < X \leq 40$	ERM effective level	Most of the ERM components are included

Table 6.3 shows a descriptive statistic for the ERM 40 raw score and ERM Scoring. The mean of all 40 components is a 22.897 score out of a 40 raw score. The overall mean ERM Scoring is 3.529. The financial sector has an ERM score that ranges from 4 to 5 with a mean of 4.667, which is at the level of standard ERM to effective ERM level, while non-financial companies have a lower score and the average score is 3.292. Companies in the financial sector obviously have a higher score than companies in the non-financial sector. There are significant differences in ERM scores between companies in the financial sector and non-financial sector at p-value 0.008 (<0.01).

Cronbach's alpha and composite reliability are considered in the study when the reliability of the 40 ERM variables constructed is tested. Cronbach's alpha is generally used as a measure of reliability of the variables constructed (Cronbach, 1951) and the value should be > 0.5 for indicating appropriate internal consistency (Field, 2005). Cronbach's Alpha in this sample is 0.971. Also, one can explore whether the Cronbach's Alpha will rise if an item is deleted, which would suggest that item leads to a loss in criterion validity. The result in Table 6.4 shows that none of the components deleted will lead to an increase in the value of Cronbach's alpha. Moreover, the composite reliability can be an alternative method for testing the reliability of scales. The value should be more than 0.5 or 0.6 (Raykov, 1997). The

coefficient of reliability calculated in this sample was 0.972, indicating that ERM components have a high degree of reliability, acceptable content and construct validity.

Table 6.3 Descriptive statistic of ERM Scoring

Variable	ALL			Financial			Non-Financial		
	Mean	Std. Dev.	N	Mean	Std. Dev.	N	Mean	Std. Dev.	N
ERM 40 SCORE	22.897	12.090	87	33.162	3.558	15	20.759	12.151	72
ERM Scoring	3.529	1.413	87	4.667	0.488	15	3.292	1.428	72
Composite Reliability	0.972								
Cronbach's Alpha	0.971								
<i>ERM scoring between the Financial and Non-Financial Sector</i>									
Pearson Chi-Square				13.913					
P-value				0.008					

Figure 6.1 shows the number of companies with their ERM scores. Most of the companies in the sample, 28 companies, are in the effective level category with an ERM score of 5. While 25 companies have an ERM score of 4, and so can be categorised in the ERM level. There were 11 companies that had an ERM score 3 and another 11 had an ERM score of 2. 12 companies can be classified as having no, or only a weak, risk management level in ERM, scoring just 1. Therefore, around 53 companies in the sample achieved a level of ERM implementation, and 34 companies were in the risk management level or the start of ERM implementation level.

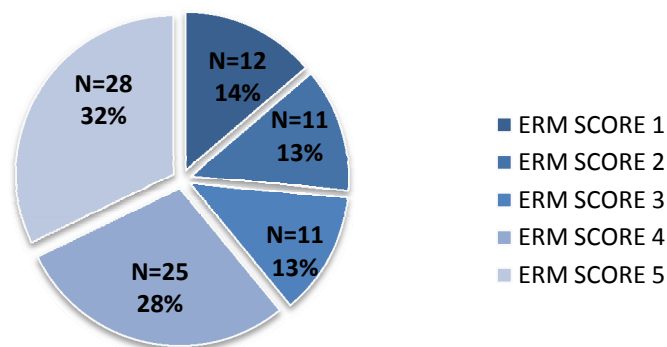


Figure 6.1 Number of companies by ERM Score

Table 6.4 Scale reliability analysis for ERM components

	Mean	Std. Deviation	Scale Mean If Item Deleted	Scale Variance If Item Deleted	Corrected Item -Total Correlation	Cronbach's Alpha If Item Deleted
ERM1	.80460	.398809	22.09243	139.209	.720	.96811
ERM2	.73563	.443553	22.16140	138.305	.733	.96801
ERM3	.80460	.398809	22.09243	138.268	.823	.96771
ERM4	.86207	.346827	22.03496	139.878	.750	.96810
ERM5	.56264	.303305	22.33439	140.496	.773	.96815
ERM6	.59770	.493204	22.29933	138.182	.666	.96830
ERM7	.49425	.502865	22.40278	138.738	.604	.96860
ERM8	.51724	.502599	22.37979	138.997	.582	.96871
ERM9	.29885	.460408	22.59818	140.728	.477	.96912
ERM10	.72414	.449539	22.17289	137.977	.754	.96791
ERM11	.58621	.495367	22.31082	137.784	.698	.96815
ERM12	.59770	.493204	22.29933	137.955	.686	.96820
ERM13	.48276	.502599	22.41427	137.725	.692	.96818
ERM14	.60920	.490759	22.28784	137.266	.751	.96789
ERM15	.54023	.501268	22.35680	137.516	.713	.96808
ERM16	.39080	.490759	22.50623	139.287	.571	.96874
ERM17	.33333	.474137	22.56370	139.390	.583	.96867
ERM18	.47126	.502067	22.42577	138.408	.634	.96846
ERM19	.40230	.493204	22.49473	138.283	.657	.96834
ERM20	.65517	.478067	22.24186	137.581	.743	.96794
ERM21	.47126	.502067	22.42577	138.102	.660	.96833
ERM22	.52874	.502067	22.36830	139.244	.561	.96881
ERM23	.81609	.389655	22.08094	138.706	.794	.96784
ERM24	.67241	.436873	22.22462	138.566	.719	.96807
ERM25	.18582	.174108	22.71121	145.024	.260	.96953
ERM26	.44828	.500200	22.44875	142.426	.291	.97008
ERM27	.56322	.498863	22.33381	138.169	.659	.96833
ERM28	.59770	.493204	22.29933	140.101	.497	.96909
ERM29	.59770	.493204	22.29933	137.074	.765	.96783
ERM30	.64368	.481688	22.25335	138.608	.644	.96839
ERM31	.57471	.434880	22.32232	139.131	.665	.96830
ERM32	.73563	.443553	22.16140	138.152	.748	.96794
ERM33	.80460	.398809	22.09243	138.706	.775	.96789
ERM34	.42098	.266951	22.47605	141.032	.796	.96822
ERM35	.56897	.367047	22.32807	139.496	.752	.96805
ERM36	.41954	.356612	22.47749	140.737	.624	.96851
ERM37	.47126	.502067	22.42577	140.025	.494	.96913
ERM38	.73563	.443553	22.16140	138.546	.709	.96811
ERM39	.48046	.321999	22.41657	140.383	.742	.96819
ERM40	.68966	.465317	22.20738	137.447	.778	.96779
				Overall Composite Reliability		.97

6.4 Results of Cluster Analysis

Obviously, there may be natural clusters in the data that could reflect the level of ERM implementation. The second ERM measurement method of analysis was introduced by using a Cluster analysis technique. Cluster analysis has frequently been used as an important classification tool to explore patterns within data. It can also detect the significant outlier of the sample.

There are three well known clustering techniques: hierarchical clustering, K-means clustering and two-step clustering. As discussed in the methodology part of the clustering analysis, hierarchical and K-means clustering algorithms have their limitations (e.g. Bacher, 2000; Everitt et al. 2001; Huang 1998) because of the problems that are caused by commensurability variables used in the sample-based techniques of problem solving. Hierarchical clustering needs a matrix of distances to merge the most similar to the same cluster. K-means clustering requires a pre-number of clusters before analysis, and with this technique it needs to be recalculated, case in and out, until the cluster membership does not change and is not robust to outliers.

The SPSS two-step clustering analysis procedure was employed to construct ERM Clustering in this study. It can use both continuous and categorical variables and the number of clusters can be automatically determined. It employs a probabilistic model where the distance between each cluster is equivalent to the decrease in the log-likelihood function.

With the same sample that was used to construct the ERM Scoring method, the ERM 40 raw score is employed as variables, which are used to categorise the clusters due to their similarity. Figure 6.2 is a description of the cluster model summary. Four clusters were formed and they indicated an order level of ERM implementation. The silhouette coefficient proposed by Rousseeuw (1987) is used to measure the quality of clusters in both the cohesion and separation of the space found between clusters. The quality of ERM Clustering is in the range of fair and appropriate, so as to represent the second ERM measurement method.

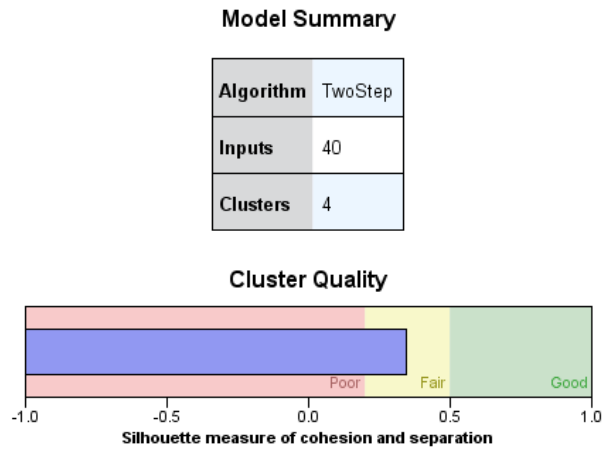


Figure 6.2 Cluster model summary

Table 6.5 below provides details of the allocation of both ERM Scoring and ERM Clustering to groups. Four clusters were formed and indicated an order level of ERM implementation. Thirteen companies were in the ERM Clustering 1 category, with 12 companies in a similar group of ERM Scoring 1 and 1 company order in ERM Scoring 2. Twenty companies were classified in the ERM Clustering 2 category, with 10 companies in ERM Scoring 2, and the rest of the 10 companies in the ERM group scoring 3. There were 31 companies classified as ERM Clustering, with 3 categories that divided 1 company as ERM Scoring 3, 24 companies as ERM Scoring 4, and 6 companies as ERM Scoring 5. There were 23 companies in the last group, which was ERM Clustering 5, 1 company was classed as ERM Scoring 4, and 22 companies were in ERM Scoring 5 group. ERM Scoring and ERM Clustering were shown to be highly related, as indicated by the test of association with $\chi^2 = 207.067$ and $p = 0.000$ and with Pearson's correlation coefficients correlations at the level of .948.

Table 6.5 Frequency comparing ERM Scoring and ERM Clustering methods

<i>ERM Scoring</i>	<i>ERM Clustering</i>				Total
	1	2	3	4	
1	12	-	-	-	12
2	1	10	-	-	11
3	-	10	1	-	11
4	-	-	24	1	25
5	-	-	6	22	28
Total	13	20	31	23	87

Table 6.6 shows a descriptive statistic of ERM Scoring and ERM Clustering. The result of ERM Clustering is in the same direction as the ERM Scoring method. The ERM Scoring scale goes from 1 to 5, which has a mean of 3.529; while the ERM Clustering scale from 1 to 4 has a mean of 2.736. In the financial sector, ERM Clustering has an ERM scale range from 3 to 4, which has a mean in the level of good and effective ERM practice. There was a similar result in the financial sector of ERM Scoring, which also had an ERM scale range 4 to 5. In the non-financial sector, both ERM Scoring and ERM Clustering had a range from the low to the high ERM scale, from 1 to 5 in ERM Scoring and 1 to 4 in ERM Clustering.

Table 6.6 Descriptive statistics of ERM Scoring and ERM Clustering

<i>Variable</i>	All sample					Financial sector					Non-Financial sector				
	<i>Max</i>	<i>Min</i>	<i>Mean</i>	<i>Std. Dev.</i>	<i>N</i>	<i>Max</i>	<i>Min</i>	<i>Mean</i>	<i>Std. Dev.</i>	<i>N</i>	<i>Max</i>	<i>Min</i>	<i>Mean</i>	<i>Std. Dev.</i>	<i>N</i>
<i>ERM SCORING</i>	5	1	3.529	1.413	87	5	4	4.667	0.488	15	5	1	3.292	1.428	72
<i>CLUSTERING</i>	4	1	2.736	1.017	87	4	3	3.667	0.488	15	4	1	2.542	0.992	72

Most ERM research has studied the financial sector (e.g. Eckles et al., 2014, Hoyt and Liebenberg, 2011, Lin et al., 2012, McShane et al., 2011, Pooser, 2012) and so there has been very limited ERM research in the non-financial sector (Quon et al., 2012, Gordon et al., 2009). As the result of this study in Thailand, it can be seen that most of the financial companies have a good to effective ERM practice because of the regulatory compliance constraints. Therefore, research into ERM and other behaviours might have had limited results because only the financial sector was studied. There is growing interest in ERM in businesses and a need for more accurate results of ERM practice. It is therefore important to carry the research into both the financial and non-financial sectors to gain more insight from the study of ERM and behaviours.

6.5 Results of PCA Analysis

Often scales are developed by the use of principal component analysis (PCA). Hence, it was decided to explore its use to develop a method for measuring ERM implementation. The results of PCA are shown in Table 6.7. There are 7 principal components that have an eigenvalue greater than 1, and the sum of the squared loading of 7 components can explain the 73.525% of the variability in the original 40 ERM variables. Rencher (2002) suggested the number of components should be determined by where there is significant change in the amount of variation. In this case, major changes in the variation appear between the 1st and 2nd component. The first component or quality criterion had an eigenvalue of 19.96 and accounted for 49.891% of the total variation in the original variables.

Table 6.7 PCA total variance explained

PC	Initial Eigenvalues		
	Total	% of Variance	Cumulative %
1	19.96	49.891	49.891
2	2.552	6.38	56.271
3	1.882	4.705	60.976
4	1.462	3.654	64.63
5	1.385	3.462	68.092
6	1.172	2.931	71.023
7	1.001	2.502	73.525
8	0.897	2.243	75.768
Kaiser-Meyer-Olkin's test (KMO)			0.905
Bartlett's test of Sphericity:			5280.3
Chi-square			
P-value			0.00

Several tests were carried out such as the Kaiser-Meyer-Olkin (KMO) to measure, communalities and Bartlett's test of sphericity to ensure the model was appropriate. The KMO measurement of sampling adequacy provided evidence that the data is appropriate for a PCA. KMO ranges from 0 to 1 and the minimum acceptable level should be $>.50$ (Kinnear and Gray, 1994, Tabachnick and Fidell, 2001). Kaiser (1970) recommended the levels of KMO as follows: a measure > 0.9 is marvellous, > 0.8 is meritorious, > 0.7 is middling, > 0.6 is mediocre, > 0.5 is miserable and < 0.5

is unacceptable. Communalities represent the proportion of variance that is accounted for by various factors and general communalities, and after extraction of all the variables it should be > 0.50 , or the average communality greater than 0.6 (Field, 2005). Bartlett's test of sphericity tests whether covariance matrix is equal to identity matrices. If the hypothesis is rejected, then the correlation between variables in the correlation matrix is highly significant. Bartlett's test of sphericity was calculated to assess a principal component factor analysis that was appropriate and must be significant at 0.05 (Merkle et al., 1998).

The value KMO measure 0.905 (> 0.50) in this study is in the excellent level, indicating that the sample was adequate for a factor analysis. The lowest communalities extraction of all variables is 0.57 (> 0.50) and means the communality of the variables was .735 (> 0.60), indicating that each ERM variables have much in common variance with the other variables accounted for by the extracted factors. Therefore, the communalities are considered to be satisfied. Bartlett's test of sphericity was 5280.3 ($P < 0.001$), indicating that it was appropriate to conduct a factor analysis for further analysis.

The factor loading for the principal component refers to the correlation between each of the original variables and a specific component. A higher values of factor loadings means a specific original variable has a closer relation to an observed component (Beaumont, 2012). With regards to determining the significance of factor loading, Hair et al. (1998) suggested that factor loading ≥ 0.3 is the minimum loading in components, factor loading ≥ 0.4 are fairly important and an significant coefficient ≥ 0.5 referred to was practically significant. Table 6.8 represented PCA component matrix. By using factor loading ≥ 0.5 , 37 ERM variables, including the first components except for evidence of the prepared self-control assessment by all staff (ERM 9 with loading 0.46), responsible in the overall risk management process activities of in entity level by the Board of Directors (ERM 26 with loading 0.41) and the frequency of discussions by the Board discussing or receiving reports on risk management (ERM 25 with loading 0.02). With factor loading ≥ 0.4 or ≥ 0.3 , the 39 variables include in the first components only 1 (ERM 25) out of the original 40

variables. The first factor consisted of most of all 40 the ERM original variables contributing.

Besides PCA method, factor rotation is explored, Table 6.9 showed PCA upon varimax rotation. The goal of factor rotation is to maximise the variance of loading of the squared loadings; thus all the coefficients will be either near 1 or 0 (Dunteman, 1989). Then, each variable can be separated into a set factor. These variables can be categorised into 6 categories as shown in Table 6.10.

To construct a PCA factor score that maximises validation and determinacy, Thurstone (1935) recommended a principal component regression approach, which is a technique for estimating the factor score coefficients of each individual case (survey's response) on each principal component. The PCA factor score is standardised to a mean of zero, so the sum of the mean in all cases of the same principal component will be equal to 0. The variances of the distribution of the factor score by components will be 1 on the PCA method. PCA regression scores can be calculated in SPSS, and the results can be saved as an output variable of each component computed.

PCA was used to build a composite of the ERM PCA variable, based on the same 40 individual ERM components as ERM Scoring and ERM Clustering. The PCA procedure was used in order to produce linear combinations of variables into a single score uncorrelated with each other. For the ERM PCA variable, the principal PCA method was applied by form factors that captured the different dimensions of ERM and determined which of the original ERM indicators were associated with each factor. In this method, the individual variable is reduced into a smaller number of principal components that account for most of the variance in the observed variable. In terms of the PCA, there were results in seven factors. The first factor captured 49.89% of the total variance of the original data and the rest of the factors had only a minor impact in gaining a better interpretation of the components, as the result of scree plots of principal components shown in Figure 6.3. Therefore, the first principal component of the PCA score coefficients was appropriate to represent the ERM PCA scoring approach.

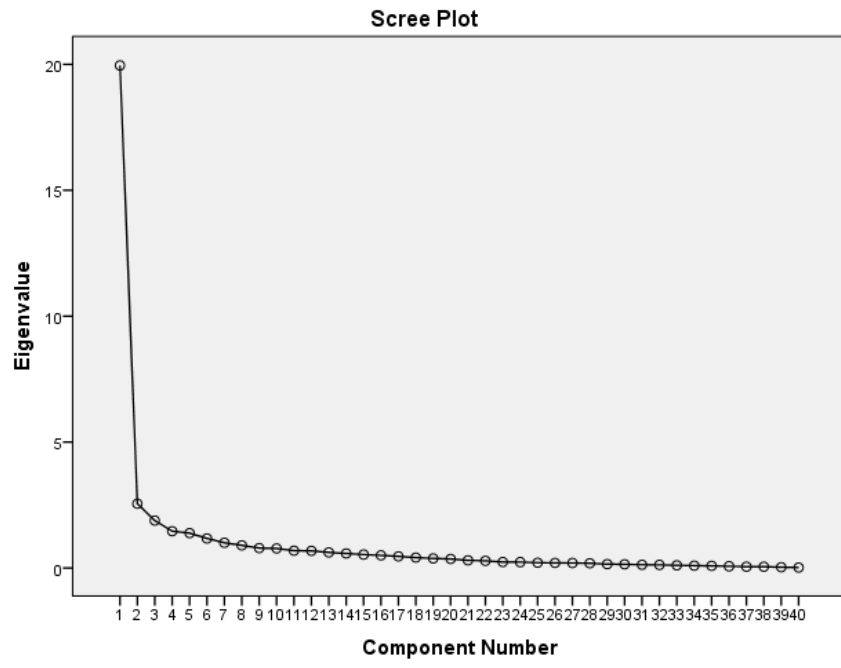


Figure 6.3 Scree plots of principal components

Table 6.8 PCA Component Matrix

Component	Component Matrix						
	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6	Factor 7
ERM1	.739	-.345	.078	.056	.177	.268	.061
ERM2	.756	-.194	.238	.075	.117	.116	.049
ERM3	.822	-.297	.097	.091	.022	.203	-.068
ERM4	.793	-.384	.123	.185	.039	.166	.024
ERM5	.809	-.156	-.049	.163	.189	.124	-.053
ERM6	.677	-.015	-.156	-.226	.030	.288	-.069
ERM7	.636	.231	-.298	-.075	.072	.174	.026
ERM8	.635	-.048	-.038	-.436	.056	-.114	.171
ERM9	.465	-.081	.208	-.591	-.028	-.078	.368
ERM10	.805	-.029	.240	.057	-.317	.019	.050
ERM11	.715	.108	.426	-.298	.025	.061	-.022
ERM12	.723	.208	.088	.133	-.190	.201	.000
ERM13	.685	.350	.208	-.219	.059	.293	-.008
ERM14	.769	.153	.135	.094	-.119	-.071	-.338
ERM15	.716	.228	.279	-.242	.165	.018	-.228
ERM16	.601	.548	-.079	.262	.067	.076	-.103
ERM17	.592	.615	.043	.018	.227	.067	-.007
ERM18	.665	.470	-.099	.231	.072	-.105	.093
ERM19	.664	.529	.024	-.027	.279	-.099	.130
ERM20	.748	.076	.199	.189	-.321	-.108	.057
ERM21	.641	.243	.096	.055	.092	-.210	.361
ERM22	.621	-.012	.348	-.116	-.290	-.160	-.007
ERM23	.845	-.227	.082	.034	-.246	.112	.002
ERM24	.792	-.123	-.028	.004	-.164	.140	.005
ERM25	.024	-.227	.300	.422	.372	.256	.368
ERM40	.796	-.016	.121	.092	-.335	-.168	.050
ERM26	.416	-.314	.269	.044	.385	-.274	.016
ERM27	.702	.159	.137	.281	-.057	-.267	.077
ERM28	.614	-.284	.085	-.037	.264	-.095	-.289
ERM29	.756	.139	-.059	.016	-.174	.197	-.209
ERM30	.680	-.017	-.195	-.071	.313	-.166	-.067
ERM31	.692	.041	-.391	-.125	.052	-.050	-.136
ERM32	.814	-.171	-.194	-.078	-.101	-.117	-.012
ERM33	.829	-.312	-.146	-.030	.042	-.101	-.112
ERM34	.849	-.158	-.214	-.163	.033	-.097	-.006
ERM35	.756	-.031	-.324	.191	-.125	-.122	.135
ERM36	.663	-.057	-.403	.040	-.149	-.027	.329
ERM37	.560	-.068	-.481	-.085	-.038	.308	.165
ERM38	.789	-.250	-.079	.112	.065	-.282	-.108
ERM39	.802	-.092	-.215	.056	.164	-.221	-.075

Table 6.9 PCA Rotation Component Matrix

Component	Rotated Component Matrix						
	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6	Factor 7
ERM1	.337	.427	.082	.456	.166	.293	.396
ERM2	.455	.244	.209	.438	.209	.219	.328
ERM3	.508	.410	.115	.468	.099	.308	.255
ERM4	.524	.394	.056	.487	.079	.206	.368
ERM5	.342	.447	.294	.510	.019	.199	.241
ERM6	.206	.525	.231	.227	.219	.389	-.020
ERM7	.124	.544	.463	.130	.107	.176	-.044
ERM8	.186	.365	.191	.310	.575	.052	-.095
ERM9	.201	.177	.047	.119	.818	.046	.004
ERM10	.764	.255	.234	.198	.220	.129	.072
ERM11	.449	.025	.354	.283	.506	.364	.042
ERM12	.559	.315	.435	.061	.053	.233	.086
ERM13	.304	.199	.552	.071	.348	.455	.056
ERM14	.580	.145	.427	.385	-.020	.243	-.165
ERM15	.309	.037	.501	.394	.329	.401	-.088
ERM16	.269	.227	.767	.075	-.155	.122	-.015
ERM17	.131	.134	.835	.091	.125	.180	.007
ERM18	.301	.279	.744	.141	-.003	-.100	.022
ERM19	.133	.176	.816	.205	.262	.008	.032
ERM20	.756	.196	.324	.175	.108	-.025	.038
ERM21	.326	.197	.540	.187	.336	-.225	.174
ERM22	.657	.022	.158	.216	.339	.077	-.079
ERM23	.680	.440	.097	.316	.173	.201	.102
ERM24	.532	.483	.179	.270	.151	.203	.067
ERM25	-.017	-.078	.008	.086	-.059	-.029	.801
ERM40	.748	.283	.251	.252	.176	-.050	-.039
ERM26	.134	-.072	.062	.652	.212	-.070	.261
ERM27	.557	.131	.479	.313	.049	-.180	.082
ERM28	.221	.158	.099	.697	.088	.225	.029
ERM29	.488	.410	.370	.188	.007	.344	-.104
ERM30	.079	.382	.368	.567	.160	.019	-.036
ERM31	.157	.577	.321	.378	.082	.093	-.232
ERM32	.439	.545	.167	.439	.198	.014	-.102
ERM33	.396	.504	.105	.618	.138	.087	-.018
ERM34	.334	.573	.220	.505	.273	.063	-.086
ERM35	.428	.611	.300	.285	.004	-.186	.005
ERM36	.312	.716	.207	.123	.159	-.208	.045
ERM37	.093	.786	.144	.056	.094	.136	.051
ERM38	.432	.359	.180	.663	.062	-.079	-.013
ERM39	.284	.459	.335	.606	.079	-.054	-.044

Table 6.10 Summary of PCA Rotation Component Matrix

Factor	Component	Factor Loading
Factor 1	ERM10 RMPOLICY_PREP	.764
	ERM20 RMCOM	.756
	ERM40 INDP_COMMITTEE	.748
	ERM23 RMPOLICY	.680
	ERM22 RM_STRUCTURE	.657
	ERM14 APPETITE_PREP	.580
	ERM12 RMFRAME_PREP	.559
	ERM27 CRO_RESP	.557
	ERM24 APPLIED_POLICY	.532
	ERM4 BENEFIT	.524
	ERM3 RMOVERSIGHT	.508
Factor 2	ERM37 RISKIT	.786
	ERM36 KNOW_STAFF	.716
	ERM35 KNOW_DIR	.611
	ERM31 REPUT_RISK	.577
	ERM34 COMMU_CHANNEL	.573
	ERM32 COMMU_PART	.545
	ERM7 CRISISMGT_PREP	.544
	ERM6 BCP_PREP	.525
Factor 3	ERM17 TOLERANCE_REV	.835
	ERM19 REGISTER_REVI	.816
	ERM16 TOLERANCE_PREP	.767
	ERM18 REGISTER_PREP	.744
	ERM13 RMFRAME_REVI	.552
	ERM21 RMDEPT	.540
	ERM15 APPETITE_REVI	.501
Factor 4	ERM28 ENTITY_PART	.697
	ERM38 MONITOR	.663
	ERM26 BOD_RESP	.652
	ERM33 COMMU_RESP	.618
	ERM39 SIGN_MONITOR	.606
	ERM30 STRATEGIC_RISK	.567
	ERM5 LEV_BENEFIT	.510
Factor 5	ERM9 SCASTAFF_PREP	.818
	ERM8 SCABOARD_PREP	.575
	ERM11 RMPOLICY_REV	.506
Factor 6	ERM25 BD_REPORT	.801

6.6 Results of PLS Regression

PLS is a linear predictive model that deals with highly collinear variables and takes into account specific dependent variable(s). The PLS method served well in extracting the number of measured factors that were based on both independent variables (X) and dependent variables (Y), unlike the PCA method. PLS presents many advantages on model constructing and exploratory studies (Gefen et al., 2000), as there are minimal requirements on sample size and it is appropriate for a complex model (Gefen and Straub, 2005).

To construct the ERM PLS method in this study, path diagrams based on SPSS PLS regression path analysis and PLS structural equation models (PLS-SEM) can be analysed by using PLS analysis to create proxies for the latent variables by means of a linear compound. Four predictive models can be formed, according to different predicted dependent variables. These are three models using each variable Y separately, and one model incorporating all three variables. These three variables are measures of the firm performance: Tobin's Q, ROE and ROA. The results of the estimation of the parameters of these four PLS regression models are calculated and used to derive four ERM PLS scores: 1) ERM PLS TOBIN'S Q, using Tobin's Q as a predictor; 2) ERM PLS ROE, using ROE as a predictor; 3) ERM PLS ROA, using ROA as a predictor; and 4) ERM PLS ALL, combining Tobin's Q, ROE and ROA as predictors.

To decide the proper estimation of the parameters of the PLS regression model, panel A to panel C show the predictive PLS model of 40 ERM components and each firm performance: with Tobin's Q, ROE and ROA used respectively in the different factor levels. Table 6.11 shows the individual and cumulative variation and adjusted R-square of the PLS model. The percentage of variance is explained by PLS latent factors and the adjusted R-square was used to select the most appropriate PLS model in each of these cases.

Table 6.11 panel A shows the result of predictive PLS of the ERM components and Tobin's Q. The first eight latent factors explained 67.9 percent of variance in the X variables and 57.4 percent of variance in the Tobin's Q variable, with the highest

overall having an explained variance of (R^2) 0.534. When the latent factors were increased to 9, the adjusted R-square was reduced to 0.533. The estimation of these PLS model parameters were used to construct ERM PLS Tobin's Q as the first PLS predictor. Also, in Table 6.11 panel B, the result represented the predictive PLS regression of the ERM components and ROE. The estimation of the 7 PLS components parameter is suitable to construct ERM PLS ROE as the second PLS predictor with cumulative X's variance of 65.8 percent, ROE variance of 47.7 percent and the highest adjusted R-square 0.435, with more than 6 latent factors 0.431 and 8 latent factors 0.434. Therefore, 7 factors were used to estimate this PLS regression ROE model. Similarly, in Table 6.11 panel C, 7 factors show the results of the most fitting model with cumulative X's variance of 65.8 percent, ROE variance of 41.3 percent and the adjusted R-square 0.367 is better than the 6 latent factors 0.364 and 8 latent factors 0.363. The estimation of these ROA PLS model parameters was used to construct ERM PLS ROA as the third PLS predictor.

Table 6.11 PLS variance explained

Latent Factors	X Variance	Cumulative X Variance	Y Variance	Cumulative Y Variance (R-square)	Adjusted R-square
<i>Panel A: ERM variables with Tobin's Q</i>					
1	0.474	0.474	0.074	0.074	0.064
2	0.06	0.535	0.242	0.316	0.301
3	0.036	0.571	0.126	0.442	0.423
4	0.026	0.597	0.067	0.509	0.487
5	0.023	0.62	0.033	0.542	0.516
6	0.025	0.645	0.014	0.556	0.525
7	0.014	0.66	0.012	0.568	0.532
8	0.019	0.679	0.006	0.574	0.534
9	0.020	0.699	0.004	0.578	0.533
<i>Panel B: ERM variables with ROE</i>					
1	0.485	0.485	0.113	0.113	0.104
2	0.052	0.537	0.161	0.274	0.259
3	0.032	0.569	0.098	0.372	0.351
4	0.026	0.595	0.05	0.422	0.397
5	0.022	0.617	0.033	0.455	0.425
6	0.022	0.639	0.012	0.468	0.431
7	0.018	0.658	0.009	0.477	0.435
8	0.024	0.681	0.005	0.482	0.434
<i>Panel C: ERM variables with ROA</i>					
1	0.493	0.493	0.128	0.128	0.118
2	0.031	0.523	0.137	0.265	0.249
3	0.037	0.561	0.056	0.321	0.299
4	0.038	0.599	0.035	0.356	0.328
5	0.023	0.622	0.032	0.388	0.355
6	0.02	0.642	0.016	0.404	0.364
7	0.016	0.658	0.009	0.413	0.367
8	0.020	0.678	0.002	0.416	0.363

When Tobin's Q, ROE and ROA were combined they became a set of predictors in the PLS model. This was achieved by conducting PLS-SEM by using SMARTPLS⁶ to construct a path modelling analysis. The measurement model was constructed with 40 ERM variables and the overall firm performances as a single measure. This study followed the method recommended by Bollen and Lennox (1991) and Diamantopoulos and Siguaw (2006), as a few measures were used for establishing predictor factor validity and the reliability of the measurement instrument. The Average Variance Extracted (AVE) measured the average variance capture by the factor constructed. AVE should be at least 0.5, which means 50 percent of measurement variance was captured by the model (Chin, 1998). Composite Reliability (CR) is the composite reliability of a summated scale and should be more than 0.7 (Mallat et al., 2009). Another indication of the coefficient alpha measuring of internal consistency is Cronbach's Alpha (CRA), which should be above 0.75 (Peterson, 1994). Communality is the variance of variables and represents how well the variables fit their latent factor, which is normally well above 0.60. Average Variance Extracted (AVE) in this study is 0.6958 (>0.50), Composite Reliability (CR) 0.8721 (>0.70), Cronbach's Alpha 0.7788 (>0.70) and Communality 0.6958 (>0.60); thus providing sufficient convergent, validity and internal consistency reliability. Therefore, the model construct satisfied the validity and reliability criteria. This relationship of ERM and firm performance is well constructed. Thus, the estimation of these PLS model parameters are used to construct the ERM PLS ALL as the fourth PLS predictor. Figure 6.4 shows the results of this estimation of the four types of PLS regression model parameters.

Figure 6.5 shows Path Coefficients of ERM variables and combined firm performances. Figure 6.6 represents the t-statistic of the relationship between ERM and firm performance in PLS analysis. The path coefficient for ERM components has strong significant positive effects on an ERM variable across all 40 ERM components. Also, with regards to each firm's performance, Tobin's Q, ROE and

⁶ SmartPLS is a software application for creating structural equation models (SEM), which uses the method of partial least squares (PLS) analysis. It was originated by the Institute of Operations Management and Organizations, University of Hamburg (Hansmann and Ringle, 2004).

ROA had significant positive effects with very high t-statistic values ($p < .001$) on a firm performance predictor. The initial results of the relationship between ERM and firm performance were significant with t-statistic 7.161 ($p < .001$).

Overall, four PLS regression models were calculated and the results of the estimation of the parameters of these model were used to derive four ERM PLS scores as follow: 1) ERM PLS TOBIN'S Q, using Tobin's Q as a predictor; 2) ERM PLS ROE, using ROE as a predictor; 3) ERM PLS ROA, using ROA as a predictor; and 4) ERM PLS ALL, combining Tobin's Q, ROE and ROA as predictors.

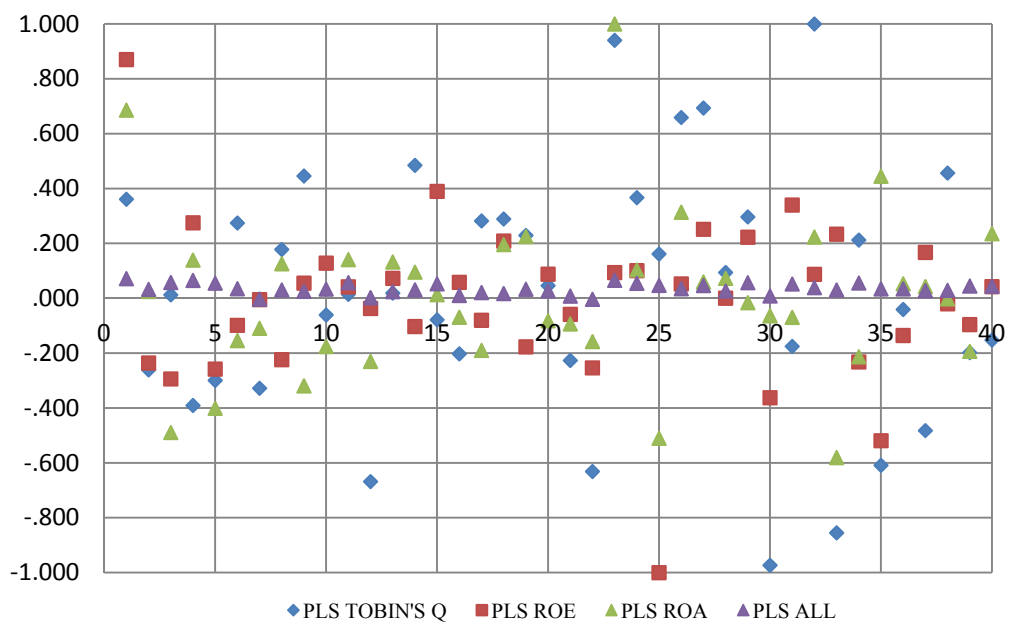


Figure 6.4 Results of the estimation of four types of PLS regression model (ordered from variables 1 to 40)

Figure 6.5 Summary of the Path Coefficients of ERM Scoring and Firm Performance

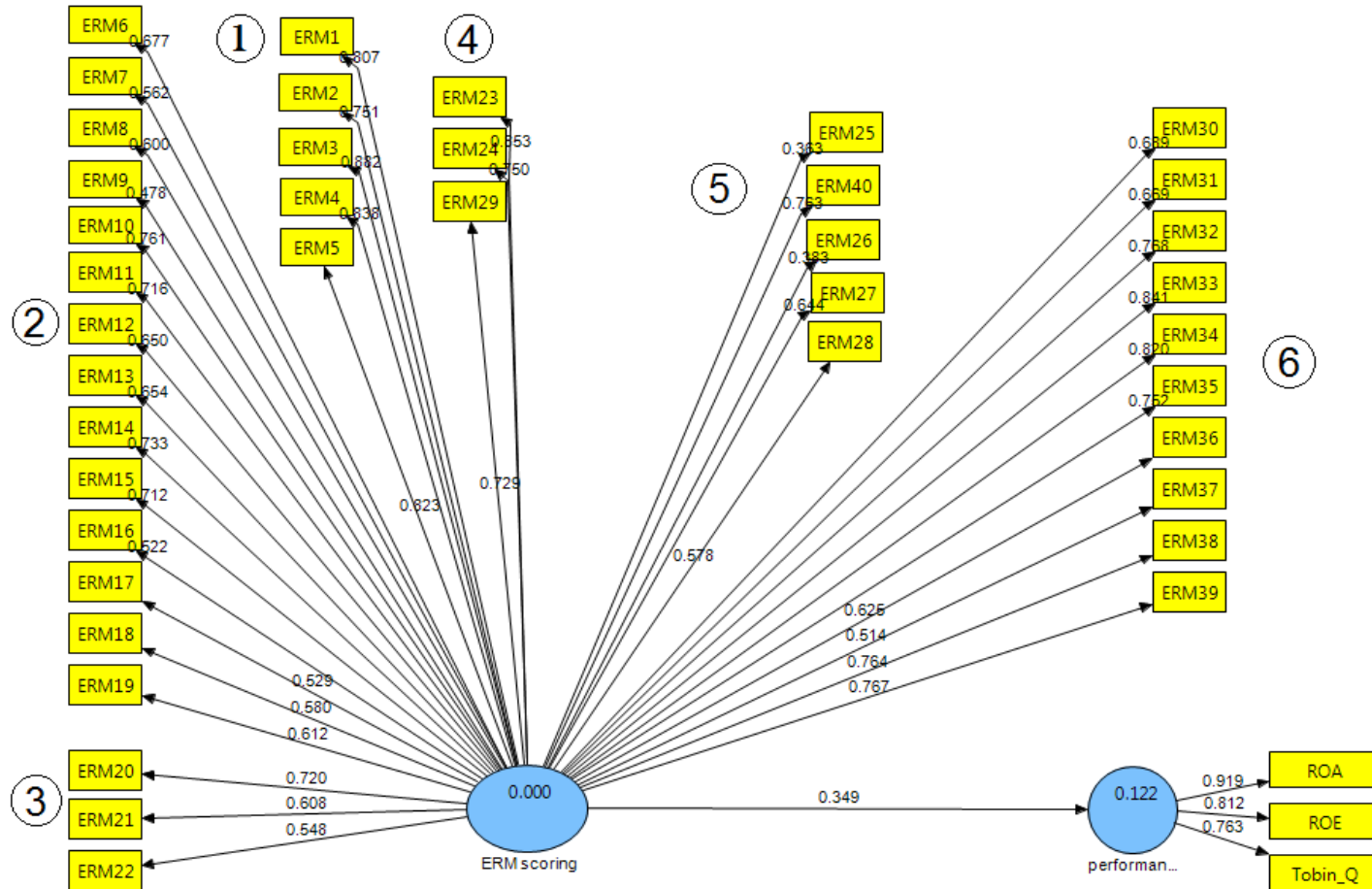
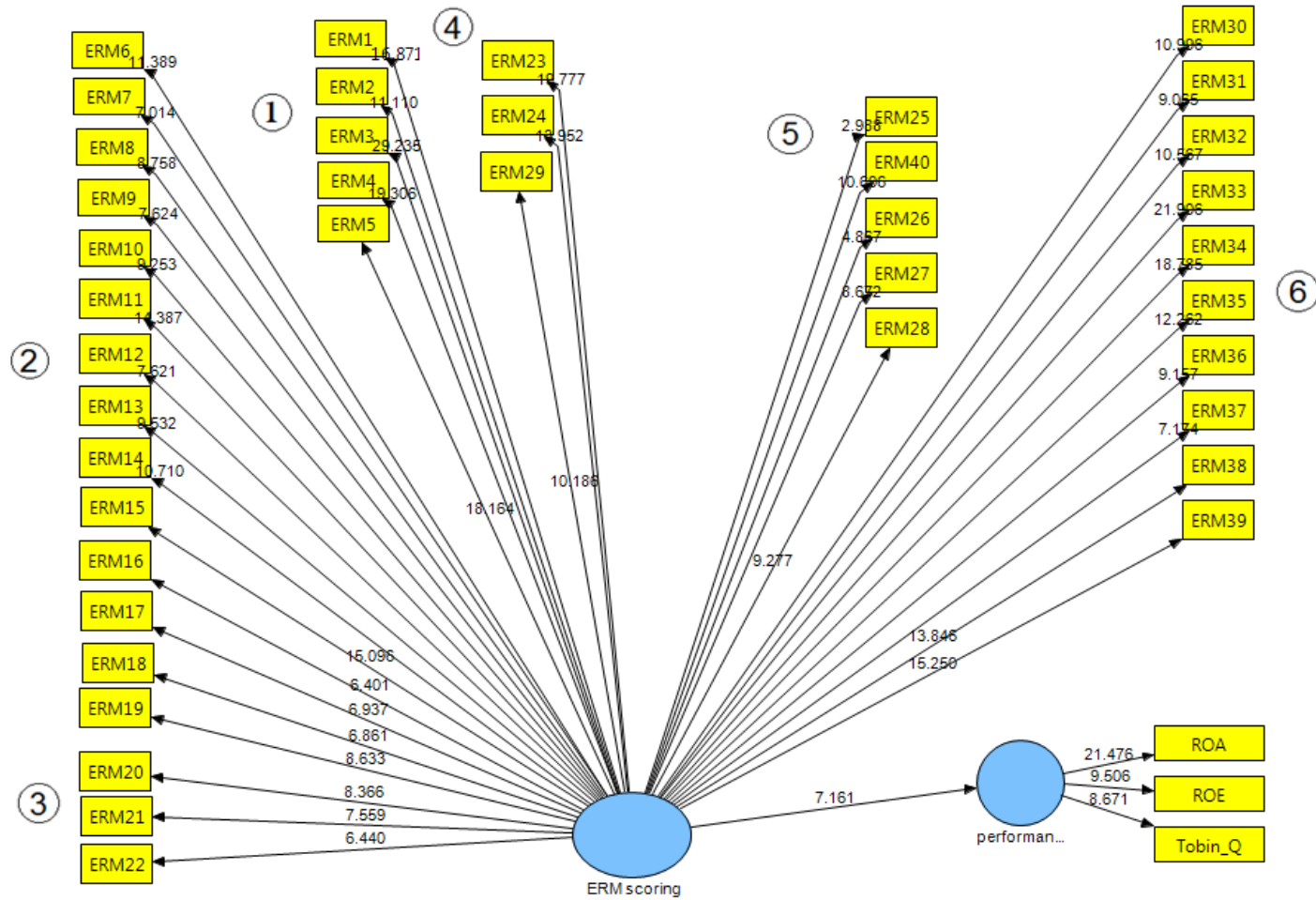


Figure 6.6 t Statistics of ERM and Firm Performance



6.7 Comparing Different ERM Methods

Table 6.12 presents both the correlations and reliability coefficients between all the ERM measures. The signs of the correlation of all ERM methods are positive and significant, with the expected positive signs of these correlations. There is a very high positive Pearson correlation and Spearman's rank correlation of the simple ERM measurement method of ERM Scoring, with three alternative ERM methods, ranging from 0.95 and 0.94 (ERM Clustering) to 0.96 and 0.96 (ERM PLS ALL) and 0.98 and 0.97 (ERM PCA), correspondingly. These correlation coefficient results are consistent with the reliability test for both Cronbach's Alpha coefficient and Cohen's Kappa coefficient. Cronbach's Alpha coefficient has a result of more than 0.90 amongst the ERM methods.

Weighted Kappa is used to measure the agreement between two raters, and is an extension of Cohen's Kappa (1960). This method is suitable for ordinal data and measuring relative concordance. If the value of Cohen's Kappa is close to one, it shows a greater similarity with the ERM Scoring method. If it is near zero, there is nearly no concordance. A negative Kappa statistic result shows disagreement. Amongst the ERM models that have values close to one, ERM Clustering has the greatest concordance with ERM Scoring, following by ERM PCA and ERM PLS ALL. The single ERM PLS (ERM PLS TOBIN'S Q; ERM PLS ROE and ERM PLS ROA) has the Kappa's value close to zero, according to the effect of its predictor when constructed by the model. ERM PCA5 (PCA component 5) has the worst and negative weighted Kappa. As a result, it can be concluded that ERM Scoring has concordance with ERM Clustering, ERM PCA and ERM PLS ALL, respectively.

ERM Scoring, ERM PCA and ERM Clustering are constructed from the 40 ERM attributes (independent variables) that an organisation should possess to be ERM compliant. Single ERM PLS variables (PLS TOBIN'S Q, PLS ROE and PLS ROA) take account of both ERM attributes and a firm performance measurement (dependent variable) when its measure was constructed. Therefore, the single PLS result should not be comparable in the study and will potentially have a lower correlation than other ERM methods. The result of the correlation analysis is as

expected. There was a low correlation of ERM Scoring, ERM Clustering, ERM PCA and ERM PLS ALL to single PLS results of PLS TOBIN'S Q, PLS ROE and PLS ROA. The positive Pearson correlation of single PLS method ranged from 0.169 (ERM Clustering and ERM PLS TOBIN'S Q) to 0.57 (ERM PCA and ERM PLS ROA).

Overall, there was high reliability in both Cronbach's Alpha coefficient and Cohen's Kappa coefficient, and high correlation in both parametric Pearson correlation coefficients and the non-parametric Spearman's rank coefficients between ERM Scoring, ERM Clustering, ERM PCA and ERM PLS ALL. Hence, these measurements of four ERM methods are comparable.

Moreover, a further comparison for selecting the best predictive statistical model will be tested in Chapter 7, which is based on the goodness of fit, and then AIC will be used as the criterion from the predictive result of the relationship between ERM and company performance, taking into accounting control variables. After finding the results of ERM and firm performance in Chapter 7, and the comparison with AIC, the best predictive result of these different ERM methods will be presented.

Table 6.12 Correlation and reliability coefficients

	<i>ERM Scoring</i>	<i>ERM Clustering</i>	<i>ERM PCA</i>	<i>ERM PLS_TQ</i>	<i>ERM PLS_ROE</i>	<i>ERM PLS_ROA</i>	<i>ERM PLS_ALL</i>
	<u>Spearman's rank correlation</u>						
<i>ERM Scoring</i>	1	.943**	.968**	.256*	.315**	.494**	.960**
<i>ERM Clustering</i>	.948**	1	.939**	0.174	.319**	.479**	.911**
<i>ERM PCA</i>	.978**	.943**	1	.295**	.457**	.574**	.988**
<i>ERMPLS_TOBINQ</i>	.220*	.169	.263**	1	.469**	.491**	.380**
<i>ERMPLS_ROE</i>	.335**	.309**	.478**	.454**	1	.573**	.506**
<i>ERMPLS_ROA</i>	.477**	.441**	.558**	.492**	.535**	1	.596**
<i>ERMPLS_ALL</i>	.961**	.917**	.991**	.334**	.520**	.572**	1
<u>Reliability Coefficients</u>							
Internal Consistency Reliability							
<i>Cronbach's Alpha</i>	1	.947	.993	.476	.408	.615	.980
Interrater Reliability							
<i>Cohen's Kappa</i>	1	.985***	.940***	.036	.171**	.156**	.879***

The Pearson correlation coefficients are below the diagonal and the Spearman rank correlation coefficients are above the diagonal. Significant coefficients at the 1%, 5% and 10% levels are noted by ***, ** and *, respectively.

6.8 Analysis of Individual Components by the Level of ERM Scoring

As an ordinal ERM Scoring method is comparable to other ERM methods, this section examines and analyses the gathered quantitative survey data from the Thai Listed companies on each ERM components by the different level of ERM Scoring. The ERM raw-score that is less than 8 components is defined as the Mean ERM score 1, which means no or weak risk management. An ERM raw-score that is greater than 32 components is defined as the Mean ERM score 5, which means effective ERM. Table 6.13 is a summary of the ERM variables by each of the categories, based on each of their ERM scores. The results show that the better the ERM score, the more ERM practice is implemented in all of the ERM categories. The companies with an ERM score of 5, has implement most of ERM components. The lowest mean in an ERM score of 5 is the responsibilities and accountability categories that will be explored. The mean values of the 40 individual ERM components for each ERM scores are presented in Table 6.14.

Table 6.13 Summary ERM categorised by ERM Scoring

ERM Categories	Mean score =1	Mean score =2	Mean score =3	Mean score =4	Mean score =5
Overall 40 ERM COMPONENTS	0.00	0.29	0.49	0.68	0.87
1. Fundamental of ERM	0.00	0.65	0.86	0.89	0.95
2. The existence of ERM evidence	0.00	0.10	0.31	0.57	0.90
3. Risk Management Structure and Architecture	0.00	0.21	0.30	0.71	0.88
4. Risk management policy and risk appetite	0.00	0.36	0.64	0.89	0.97
5. Responsibilities and accountability	0.00	0.34	0.41	0.64	0.68
6. Risk Management Process	0.00	0.35	0.60	0.69	0.83

In Table 6.14, category 1, the results of 5 fundamentals of ERM variables is shown by the level of ERM Scoring. From the level of starting to implement ERM (ERM score=3), all companies were concerned about *STRATEGIC_INVOLVE*, *RMOVERSIGHT* and *BENEFIT* variables. The companies that had an effective ERM level (ERM score=5) had implemented all the fundamental of ERM variables.

Table 6.14, category 2, shows the mean values for the existence of ERM evidence variables by the level of ERM Scoring. Most of the evidence of ERM was found in ERM level 5. Only self-assessment at staff level had a mean of 0.57. Therefore, not only self-assessment at boards, but also self-assessment at staff level should be implemented. In the level of starting to implement ERM, most of the companies with an ERM score of 3 had evidence of risk management policy and business continuity plan, which was significantly increased when compared to ERM level 2 to 1. Most of the companies in ERM level 4 had evidence of risk management frameworks and risk appetite, which was significantly increased when compared to ERM level 3 to 1. Meanwhile, companies in the ERM score level 5 had evidence of risk tolerance and risk register, which was significantly higher than the ERM score level 4 to 1. Besides this, the ERM scores 4 and the lower score showed significant gaps of the mean between preparing and reviewing ERM evidence.

Table 6.14, category 3, shows the mean values for the risk management structure and architecture variables by the level of ERM Scoring. All of the companies in the ERM score 5 had established a risk management committee (*RMCOM*) that was responsible for risk management, and the better ERM score companies showed they had consistently established a separate department for risk management (*RMDEPT*).

Table 6.14, category 4, shows the mean values for the risk management policy and risk appetite variables by the level of ERM Scoring. In *RMPOLICY* variables, all of the companies in an ERM of score 3 to 5 had a risk management policy (mean = 1.00). For *APPETITE_IDY* variables, there was no sign of identifying risk appetite in companies with an ERM score 1 and 2 (this is in risk management level), which had a mean of 0.00.

Table 6.14, category 5, shows the mean values for the responsibilities and accountability variables by the level of ERM Scoring. It could be pointed out that most of the companies in ERM level 4 and 5 had independent risk management committees and CRO responsibility to the ERM programme. However, the mean of the board of director's responsibility to the overall risk management programme in

ERM level 4 and 5 is less than the mean of the CRO's responsibility. The mean of the board of director's responsibility is quite low, ranging from 0.45-0.60. A conflict of responsibility about who is responsible for risk is clearly confirmed from Chapter 5 (section 5.5.5).

Table 6.14, category 6, shows the mean values for the rest of the 10 variables in the risk management process, including identifying and managing risk variables; communication of variables; training and development variables; technology variables and monitoring variables by the level of ERM Scoring. The result could be showing that the training programmes offered to staff members had a lower mean than the training programmes offered to directors across all ERM score levels. To achieve a more efficient ERM programme, all of the companies should offer training programmes to create risk awareness at both director and staff levels. The result also shows that all companies with an ERM score of 5 had effective communication policy and procedure.

Table 6.15 shows further analysis of ERM practice, including how companies perceive the benefit of risk (*LEV_BENEFIT*), the effective risk management structure (*RM_STRUCTURE*), the efficient communication channel (*COMMU_CHANNEL*) and monitoring techniques (*SIGN_MONITOR*) by the level of ERM Scoring.

In Table 6.15, panel A, aside from perceived benefit of risk from preventing negative outcome, it was found that the better the ERM score shown, the larger the number of companies that perceived the benefits of ERM towards value creation. These benefits include ERM being critical in achieving their business objective, aligning to strategic management, enhancing the company's ability to make better-informed decisions and promoting efficiency at all levels. However, companies with an ERM score of 5 still had a low mean 0.39 when they perceived the benefits of risk as a business opportunity.

Table 6.15, panel B, shows the further results of *RM_STRUCTURE* variables. The companies with a higher ERM score seem to have a risk management structure under

the risk management department, reporting directly to risk management committee and to the board of directors, but they needed to report risk-related information to the CEO. Therefore, this structure could be recommended as a way to gain an effective risk management structure.

When considering the means of communication channel in ERM, score 5 was only equal 0.61. Further results are shown in Table 6.15, panel C. Some risk communication techniques have low mean scores, such as self-assessment by the director and staff, signed acknowledgement of risk by staff and those concerned with the whistle-blower system in the company. These techniques should be more considered by the company.

In Table 6.15, panel D, shows the monitoring techniques used in each of the ERM Scoring levels. More advance ERM companies have applied a range of monitoring methods, such as an enterprise performance appraisal, balanced scorecards and KPI measurement, early warning indications and benchmarking themselves against policy or best practice in an effort to gain an effective ERM programme within their enterprise. To advance ERM practice, it is important to consider all these monitoring techniques.

Table 6.14 Individual components by the level of ERM Scoring

NO.	ERM VARIABLE	MEAN score =1	MEAN score =2	MEAN score =3	MEAN score =4	MEAN score =5	F	Sig.
Category 1: Fundamental of ERM		0.00	0.65	0.86	0.89	0.95		
1	ERM1 <i>STRATEGIC_INVLOVE</i>	0.00	0.73	1.00	0.92	1.00	49.22	0.00***
2	ERM2 <i>ALIGNED_PROCESS</i>	0.00	0.55	0.73	0.88	1.00	25.45	0.00***
3	ERM3 <i>RMOVERSIGHT</i>	0.00	0.55	1.00	1.00	1.00	82.31	0.00***
4	ERM4 <i>BENEFIT</i>	0.00	1.00	1.00	1.00	1.00	-	-
5	ERM5 <i>LEV_BENEFIT</i>	0.00	0.44	0.56	0.66	0.77	43.5	0.00***
Category 2: The existence of ERM evidence		0.00	0.10	0.31	0.57	0.90		
1	ERM6 <i>BCP_PREP</i>	0.00	0.18	0.64	0.68	0.93	16.86	0.00***
2	ERM7 <i>CRISISMGT_PREP</i>	0.00	0.09	0.36	0.52	0.89	15.53	0.00***
3	ERM8 <i>SCABOARD_PREP</i>	0.00	0.27	0.36	0.56	0.86	10.61	0.00***
4	ERM9 <i>SCASTAFF_PREP</i>	0.00	0.00	0.09	0.36	0.57	7.13	0.00***
5	ERM10 <i>RMPOLICY_PREP</i>	0.00	0.36	0.73	0.96	0.96	33.06	0.00***
6	ERM11 <i>RMPOLICY_REV</i>	0.00	0.09	0.45	0.72	0.96	24.37	0.00***
7	ERM12 <i>RMFRAME_PREP</i>	0.00	0.27	0.27	0.80	0.93	21.46	0.00***
8	ERM13 <i>RMFRAME_REVI</i>	0.00	0.00	0.09	0.60	0.93	30.3	0.00***
9	ERM14 <i>APPETITE_PREP</i>	0.00	0.00	0.36	0.88	0.96	48.55	0.00***
10	ERM15 <i>APPETITE_REVI</i>	0.00	0.00	0.36	0.60	1.00	31.34	0.00***
11	ERM16 <i>TOLERANCE_PREP</i>	0.00	0.00	0.18	0.36	0.82	16.41	0.00***
12	ERM17 <i>TOLERANCE_REV</i>	0.00	0.00	0.09	0.16	0.86	30.99	0.00***
13	ERM18 <i>REGISTER_PREP</i>	0.00	0.09	0.27	0.44	0.93	19.51	0.00***
14	ERM19 <i>REGISTER_REVI</i>	0.00	0.00	0.09	0.28	0.96	41.53	0.00***

NO.	ERM VARIABLE	MEAN score =1	MEAN score =2	MEAN score =3	MEAN score =4	MEAN score =5	F	Sig.
Category 3: Risk Management Structure		0.00	0.21	0.30	0.71	0.88		
1	ERM20 <i>RMCOM</i>	0.00	0.27	0.36	0.88	1.00	34.19	0.00***
2	ERM21 <i>RMDEPT</i>	0.00	0.09	0.18	0.56	0.86	16.12	0.00***
3	ERM22 <i>RM_STRUCTURE</i>	0.00	0.27	0.36	0.68	0.79	9.36	0.00***
Category 4: Risk management policy and risk appetite		0.00	0.36	0.64	0.89	0.97		
1	ERM23 <i>RMPOLICY</i>	0.00	0.64	1.00	1.00	1.00	84.66	0.00***
2	ERM24 <i>APPLIED_POLICY</i>	0.00	0.45	0.55	0.84	0.95	24.46	0.00***
3	ERM29 <i>APPETITE_IDY</i>	0.00	0.00	0.36	0.84	0.96	41.93	0.00***
Category 5: Responsibilities and accountability		0.00	0.34	0.41	0.64	0.68		
1	ERM25 <i>BD_REPORT</i>	0.00	0.25	0.23	0.19	0.22	4.96	0.00***
2	ERM40 <i>INDP_COMMITTEE</i>	0.00	0.36	0.36	0.96	1.00	42.59	0.00***
3	ERM26 <i>BOD_RESP</i>	0.00	0.45	0.55	0.60	0.46	3.45	0.01***
4	ERM27 <i>CRO_RESP</i>	0.00	0.18	0.27	0.76	0.89	19.18	0.00***
5	ERM28 <i>ENTITY_PART</i>	0.00	0.45	0.64	0.68	0.82	8.44	0.00***
Category 6: Risk Management Process		0.00	0.35	0.60	0.69	0.83		
<i>6.1 Identifying and Managing Risk</i>		<i>0.00</i>	<i>0.36</i>	<i>0.50</i>	<i>0.74</i>	<i>0.89</i>		
1	ERM30 <i>STRATEGIC_RISK</i>	0.00	0.36	0.64	0.76	0.93	15.05	0.00***
2	ERM31 <i>REPUT_RISK</i>	0.00	0.36	0.36	0.72	0.86	18.45	0.00***
<i>6.2 Communication</i>		<i>0.00</i>	<i>0.44</i>	<i>0.75</i>	<i>0.78</i>	<i>0.87</i>		
3	ERM32 <i>COMMU_PART</i>	0.00	0.45	0.82	0.88	1.00	29.02	0.00***
4	ERM33 <i>COMMU_RESP</i>	0.00	0.64	1.00	0.96	1.00	59.49	0.00***
5	ERM34 <i>COMMU_CHANNEL</i>	0.00	0.23	0.42	0.50	0.61	31.1	0.00***

NO.	ERM VARIABLE	MEAN score =1	MEAN score =2	MEAN score =3	MEAN score =4	MEAN score =5	F	Sig.
<i>6.3 Training and Development</i>		<i>0.00</i>	<i>0.32</i>	<i>0.41</i>	<i>0.59</i>	<i>0.72</i>		
6	ERM35 <i>KNOW_DIR</i>	0.00	0.36	0.45	0.74	0.79	26.56	0.00***
7	ERM36 <i>KNOW_STAFF</i>	0.00	0.27	0.36	0.44	0.66	11.93	0.00***
<i>6.4 Technology</i>		<i>0.00</i>	<i>0.09</i>	<i>0.64</i>	<i>0.48</i>	<i>0.75</i>		
8	ERM37 <i>RISKIT</i>	0.00	0.09	0.64	0.48	0.75	9.24	0.00***
<i>6.5 Monitoring</i>		<i>0.00</i>	<i>0.37</i>	<i>0.64</i>	<i>0.71</i>	<i>0.86</i>		
9	ERM38 <i>MONITOR</i>	0.00	0.45	0.82	0.92	0.96	27.89	0.00***
10	ERM39 <i>SIGN_MONITOR</i>	0.00	0.29	0.45	0.50	0.76	30.35	0.00***

Table 6.15 Further analysis of ERM components by the level of ERM Scoring

Components	SCORE =1	SCORE =2	SCORE =3	SCORE =4	SCORE =5
Panel A: Benefits of Risk Management					
- Considered critical to achievement of business goals	0.57	0.57	0.81	0.85	0.84
- Identified as aligned to Strategic Management	0.43	0.43	0.52	0.76	0.90
- Seen as a business opportunity	0.14	0.14	0.10	0.15	0.39
- Seen as helping to manage predictable and unpredictable events	0.93	0.93	0.71	0.85	1.00
- Enhances company's ability to make better-informed decisions	0.43	0.43	0.43	0.55	0.71
- Promotes management efficiency at all levels	0.21	0.21	0.33	0.55	0.71
- Can prevent unwelcome surprises	0.50	0.50	0.67	0.70	0.84
Panel B: Risk Management Structure					
- Under risk management committee – reports directly to Management Committee	0.00	0.08	0.21	0.17	0.19
- Under risk management committee – reports directly to board of directors	0.00	0.17	0.32	0.27	0.31
- Under risk management department – reports directly to both risk management committee and board of directors	0.00	0.00	0.11	0.10	0.27
- Under risk management department – reports directly to risk management committee and board of directors, but needs to report risk-related information to CEO	0.00	0.00	0.16	0.13	0.38
- Under risk management department – reports directly to Chief Executive Director or management	0.00	0.00	0.11	0.13	0.27
- Under risk management department – reports directly to finance and accounting department, CEO and risk management committee. Is independent under the board of directors	0.00	0.00	0.00	0.07	0.04

Components	SCORE =1	SCORE =2	SCORE =3	SCORE =4	SCORE =5
Panel C: Communication policy and procedures					
- Risk management as a corporate culture	0.00	0.21	0.67	0.67	0.87
- Fully communicated and acknowledged policy and procedure	0.00	0.29	0.43	0.70	0.87
- Policies and procedures in writing	0.00	0.29	0.57	0.73	0.87
- Clearly stated in the functional job descriptions or job	0.00	0.14	0.43	0.49	0.68
- Everyone needs to sign their understanding and acknowledgement of risk	0.00	0.00	0.10	0.09	0.26
- Self-assessment of employees	0.00	0.00	0.10	0.12	0.16
- Self-assessment of directors	0.00	0.07	0.00	0.18	0.32
- Concerns about whistle-blower system and complaints	0.00	0.07	0.19	0.33	0.39
Panel D: Monitoring Technique					
- Early Warning Indications established for operation	0.00	0.00	0.29	0.26	0.63
- Enterprise Performance Appraisal	0.00	0.54	0.57	0.71	0.87
- Benchmarking against policy or the best practice	0.00	0.31	0.24	0.26	0.57
- Balanced scorecards and Key Performance Indicators (KPI)	0.00	0.31	0.33	0.52	0.80

6.9 Conclusion

ERM has been advocated as an approach to tackling risk management within companies by regulators and international bodies. The main issue, though, seems to be the ERM implementation. There are a number of conflicting guidelines about ERM, which means implementation is not an easy process for an organisation. In most previous studies proxies were used as evidence of the company using ERM. Proxies have limitations and it might not be able to accurately measure the level of ERM implementation. Only a few studies have tried to use different methods by developing an ERM index or using an S&P's ERM rating to determine the level of ERM implementation. Academic research has focused on studying the relationship between ERM implementation and behaviour. This type of analysis has been hampered by the poor quality of methods to measure ERM implementation, leading to inconclusive results regarding the benefits of ERM implementation. The previous literature suggested a number of attributes that an organisation should possess to indicate the level of ERM implement. This study is the first to combine a number of guidelines, such as COSO (2004), CAS (2003), ISO 31000 (2009) and S&P's ERM rating to produce a set of 40 components of ERM that influence the best practice of ERM. The survey data from the Thai listed companies in the Stock Exchange of Thailand has provided an opportunity to collect the information on the proposed ERM components. These ERM components can be grouped into six categories: fundamental ERM; existence of ERM evidence; risk management structure and architecture; risk management policy and risk appetite; responsibilities and accountability; and the risk management process, including identifying and managing risk, communication, training and knowledge development, technology and monitoring.

From the proposed ERM components, it is possible to derive a simple measure for ERM implementation that can be used as the ERM Scoring method. The ERM Score method used has equal weighting of the key components. The proposed ERM Scoring method was compared to results that used Clustering, PCA and PLS by using weighted Kappa and correlation (both Pearson's and Spearman's). It was found

that ERM Scoring was in slightly better concordance with the clustering approach than PCA procedure and PLS analysis. These methods were found to be comparable with the high correlation coefficients and Cronbach's Alpha coefficient with ERM Scoring.

From the analysis of individual components by the level of ERM Scoring, all the individual ERM components that were proposed led to a better level of ERM implementation. By the analysis on each categories, the results can be pointed out that the responsibilities and accountability category seems to be the most problematic of ERM implementation. The main issue is a conflict of ERM responsibility, as the mean of the board of director's responsibility to ERM is lower than the mean of the CRO's responsibility to ERM. It is suggested that the board of directors should have the main responsibility for the ERM programme.

By the analysis of each component, the companies with a better ERM score recognise that ERM has not only a protected negative effect on their business, but also realise its benefit through value creations. Most of the companies with an ERM score of 5 prepared and reviewed all of their ERM documents as well. When it came to the risk management structure and architecture, all the companies with an ERM score of 5 had a risk management committee. The results also revealed that the recommended risk management organisational structure should contain a risk management department, which reports directly to the board of directors, but also needs to report all risk-related information to the CEO.

Moreover, the key to gaining a more effective ERM implementation is the process of identifying and managing risk, especially strategic risk and reputation risk. Risk management should be embedded into corporate culture. Knowledge of risk management should be expanded, not only at director and management level, but also throughout the staff. Finally, in order to advance ERM practice it is important to consider the fundamental monitoring system combined with various methods, such as early warning indications established for the company's operations, benchmarking against policy or best practice, as well as balanced scorecards and KPI measurement.

Chapter Seven

Empirical Result of Enterprise Risk Management Study

7.1 Introduction

Given the interest in ERM by companies, rating agencies, regulators and government there is the need to explore the impact of implementation of ERM. It is important to explore whether ERM is related to firm value. The goal of developing the ERM Scoring in Chapter 6 is to explore the relationship between ERM implementation and firm performance. In examining this, an analysis account has to be taken of appropriate control variables. The study is based on the ERM survey of Thai listed companies and other control variables collected from their annual report, SET Market Analysis and Reporting Tool, company's annual report and DataStream databases.

In this Chapter, the ERM Score is also investigated against alternatives by comparing their predictive abilities. The alternatives were cluster analysis, principal components analysis and partial least square analysis. The comparison uses goodness of fit and AIC as the basis for judgement.

Similar to the problems of understanding the relationship between ERM and firm performance, there also difficulties in understanding the determinant of ERM implementation, as there was also a lack of a reliable measurement of ERM implementation. With the ERM Score it is possible to explore the relationship between ERM implementation and firm-specified characteristics.

The structure of the chapter proceeds as follow. In the next section, the relationship between ERM implementation scores and firm performance is discussed. Judgement on the ERM implementation score with best predictive ability for firm performance is considered. The penultimate section considers the determinants of successful ERM implementation and finally there is a conclusion.

7.2 Results of ERM and Firm Performance

7.2.1 Description of Variables Measures

The relationship between a firm's ERM and its performance is contingent on there being a proper match between a firm's ERM implementation and firm-related variables. The data on ERM is obtained from a measure of ERM implementation created from the survey data in Chapter 6. The ERM Scoring method is a simple ordinal scale used to find the relationship between ERM and firm performance. Three firm performances measurements, based on financial market criteria and accounting performance measurement, are considered: Tobin's Q, ROE and ROA. These firm performance measures and control variables are obtained from SETSMART (a Thai listed Company Database) and DataStream. The definition and expected signs are shown in Table 7.1. The initial assumption will be a linear form that can be fitted by using OLS regression.

Table 7.1 Variable measures

Variable Name	Expected Sign	Definition	Datasource
<u>Dependent variable: Performance Measurement</u>			
<i>TOBINQ</i>		the market value of a company + Total Liabilities/ Total Firm's assets value	DataStream (MV) and Setsmart
<i>ROE</i>		Net Income/ Shareholder's Equity	Setsmart
<i>ROA</i>		Net Income/Average Total Assets	Setsmart
<u>Independent variable: ERM METHOD</u>			Survey Collection
<i>ERM Scoring</i>	+/-	the proposed ordinal ERM score	
<i>ERM Clustering</i>	+/-	the proposed clustering ERM score	
<i>ERM PCA</i>	+/-	the proposed PCA ERM score	
<i>ERMPLS_TOBINQ</i>	+/-	the proposed PLS ERM score based on Tobin's Q as a predictor	
<i>ERMPLS_ROE</i>	+/-	the proposed PLS ERM score based on ROE as a predictor	
<i>ERMPLS_ROA</i>	+/-	the proposed PLS ERM score based on ROA as a predictor	
<i>ERMPLS_ALL</i>	+/-	the proposed PLS ERM score based on combining Tobin's Q, ROE, ROA as a predictor	

Control Variables

Firm Size (<i>Size</i>)	+	Log (book value of asset)	Setsmart
Industry Effects			
Market Share (<i>IND</i>)	+	Firm's sales/ Total Sales of Industry	Setsmart
Firm Characteristic:			
Leverage (<i>LEV1</i>)	+/-	Long Term Debt/ (Total Liability + Shareholder Equity)	Setsmart
(<i>LEV2</i>)	+/-	Leverage (Total liabilities divided by the market value of equity)	Setsmart
DIVIDENDS (<i>DIVIDENDS</i>)	+/-	One if the company pays a dividend on that year, and zero otherwise.	Setsmart
REPUT (<i>REPUT</i>)	+	Number of years since incorporation for firm i	DataStream (WC18272)
Growth Opportunity			
GROWTH (<i>GROWTH</i>)	+	$(Sales_t - Sales_{t-1}) / Sales_{t-1}$	Setsmart
Environment Uncertainty			
Technology (<i>TECH</i>)	-	Coefficient of variation of the sum of capital expenditures (5 years)	COV (sum of 5 year DataStream (WC04601))
MARKET (<i>MARKET</i>)	-	Coefficient of variation of sales (5 years)	COV (sum of 5 year DataStream (WC01001))
INCOME (<i>INCOME</i>)	-	Coefficient of variation of net income before taxes (5 years)	COV (sum of 5 year DataStream (WC01401))
Economic factor			
GPD (<i>ECON</i>)	+	Percentage change of Domestic Production by sector	Bank of Thailand

Note: ERM = Enterprise Risk Management; ROA = Return on Asset; ROE = Return on Equity SIC = Standard Industrial Classification. This Table provides the definition and the expected sign for each variable. The accounting data are in thousands of Thai Baht and are lagged data, as the account in statement of financial position is collected as the end of 2011. For example, total assets are measured at the end of 2011. The average data is the average of the value on the end of 2011 and the value end of 2010, while the data in the income statement is measured over the period from the end of 2010 to the end of 2011.

7.2.2 Descriptive Statistic Categorised by ERM Scoring

The mean values for the dependent and control variable for each ERM scored categories is shown in Table 7.2. The relationship between ERM Scoring and firm value illustrates that firm performance appears to be the highest for ERM category 3. There are potential outliers in both ERM categories 4 and 5, which lower their average scores. It was found that control variables have apparently a positive pattern with ERM rating such as *SIZE*, *IND*, *INCOME* and *ECON* factors.

Table 7.2 Descriptive statistic categorised by ERM Scoring

Variable	<i>ERM Scoring</i>									
	1 (N=12)		2 (N=11)		3 (N=11)		4 (N=25)		5 (N=28)	
	<i>Mean</i>	<i>SD.</i>	<i>Mean</i>	<i>SD.</i>	<i>Mean</i>	<i>SD.</i>	<i>Mean</i>	<i>SD.</i>	<i>Mean</i>	<i>SD.</i>
<i>ROA</i>	-1.78	12.22	7.08	4.63	12.23	9.78	9.81	8.28	9.33	12.57
<i>ROE</i>	-8.07	25.3	6.75	12.22	28.94	46.57	13.61	21.19	13.64	23.64
<i>Tobin's Q</i>	0.97	0.30	1.30	0.79	1.56	0.70	1.33	0.51	1.51	0.91
<i>Size</i>	6.36	0.46	6.79	0.59	6.40	0.46	7.12	0.79	7.69	1
<i>IND</i>	0.00	0.01	0.02	0.02	0.00	0.00	0.02	0.04	0.08	0.14
<i>LEV1</i>	1.37	1.95	1.09	0.78	3.9	9.17	2.38	2.72	3.68	4.27
<i>LEV2</i>	1.38	1.89	1.17	0.99	0.88	0.76	1.44	1.37	2.85	3.91
<i>REPUT</i>	25.58	15.41	29.45	13.56	24.45	14.2	23.92	20.14	31.43	25.24
<i>GROWTH</i>	-0.15	0.31	0.09	0.33	0.20	0.41	0.20	0.20	0.10	0.21
<i>TECH</i>	0.75	0.39	0.57	0.36	0.66	0.34	0.61	0.42	0.51	0.26
<i>MARKET</i>	0.27	0.19	0.24	0.19	0.27	0.18	0.23	0.22	0.16	0.09
<i>INCOME</i>	1.76	1.76	0.51	1.68	-0.11	3.4	1.65	4.2	2.06	5.85
<i>ECON</i>	0.01	0.03	0.01	0.04	0.00	0.04	0.03	0.04	0.04	0.05

Note: ERM = Enterprise Risk Management. This Table provides the mean value for the variables of all samples in each *ERM Scoring* category. All variable definition are provided in Table 7.1

Table 7.3 Sample Pearson's Correlation Coefficients.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
(1) Tobin's Q	1.000														
(2) ROE	.240*	1.000													
(3) ROA	.433**	.767**	1.000												
(4) ERM SCORING	0.200	0.206	.275*	1.000											
(5) Size	-0.015	0.144	0.123	.504**	1.000										
(6) IND	0.083	0.082	0.014	.285**	.564**	1.000									
(7) LEV1	-0.053	0.068	-.361**	0.182	.261*	0.073	1.000								
(8) LEV2	-0.165	0.043	0.081	.218*	0.033	0.080	-0.010	1.000							
(9) DIV	0.155	0.132	.307**	0.187	0.188	0.165	-.333**	-0.070	1.000						
(10) REPUT	-0.015	0.077	-0.052	0.067	.314**	0.147	.231*	-0.163	0.101	1.000					
(11) GROWTH	0.079	0.180	0.194	.241*	-0.159	-0.005	0.038	0.018	-0.003	0.184	1.000				
(12) TECH	-0.009	-0.123	-0.121	-0.184	-.376**	-.261*	-0.131	0.022	-0.152	-0.160	-0.176	1.000			
(13) MARKET	-0.037	0.039	-0.100	-0.201	-0.018	-0.105	0.136	-0.041	-.210*	-0.052	-0.029	.371**	1.000		
(14) INCOME	-0.076	-0.135	-0.152	0.082	0.090	0.115	0.005	-0.015	-0.008	0.056	-0.101	-0.028	-0.146	1.000	
(15) ECON	-0.195	0.054	-0.055	.271*	.243*	-0.105	.271**	0.026	-0.162	0.113	-0.015	-0.025	0.120	0.149	1.000

This Table presents the correlation coefficients for the performance and control variable. (1) - (3) is the performance variable, (4) is ERM Scoring and (5) – (15) is the control variable. The Pearson correlation coefficients are above the diagonal and the Spearman rank correlation coefficients are below the diagonal. Significant coefficients at the 1%, 5% and 10% levels are noted by ***, ** and *, respectively.

Table 7.3 shows the Pearson correlation coefficient. There are high correlations amongst control variable that could affect the significant level in many cases, indicating multi-co-linearity. The use of stepwise regression helped to determine the most parsimonious model amongst the variables. It also helps to control multi-co-linearity in the estimation of the model. Variance Inflation factors (VIFS)¹ were also explored, to examine the level of multicollinearity.

7.2.3 ERM and Firm Performance – Stepwise Regression

While prior studies used linear regression to calculate the value of ERM implement (e.g. Beasley et al., 2008, Gordon et al., 2009, Grace et al., 2015, McShane et al., 2011), such as the logit and matched sample model (e.g. Pagach and Warr, 2010) or maximum likelihood model (e.g. Hoyt and Liebenberg, 2011), this study primarily relies on linear stepwise regression analysis. Stepwise regression is an automatic procedure to select the ‘good’ subset of the predictor model (Hengl et al., 2004). Given the potential for multi-co-linearity between ERM Scoring and control variables the stepwise regression would seem most appropriate for selecting the variables within the model. Only statistically significant variable will be present in the final model, based on their level of significance (p-values).

Table 7.4 to Table 7.6 provide summaries of the main results of the relationship between ERM Scoring and Firm Performance and the following firm performance respectively: Tobin's Q, ROE and ROA. The ERM Scoring and control variable is as the following model:

$$\text{Firm performance} = \beta_0 + \beta_1 \text{ERM Scoring} + \beta_2 \text{SIZE} + \beta_3 \text{IND} + \beta_4 \text{LEVI} + \beta_5 \text{LEV2} + \beta_6 \text{REPUT} + \beta_7 \text{GROWTH} + \beta_8 \text{TECH} + \beta_9 \text{MARKET} + \beta_{10} \text{INCOME} + \beta_{11} \text{ECON} + \varepsilon.$$

Table 7.4 shows that by using stepwise regression, the procedure has automatically selected significant variables related to Tobin's Q and highlights the relationship between *ERM Scoring* and Tobin's Q. Considering the result, *ERM Scoring* and

¹ The VIF represents a factors by which the variance of the estimated coefficient is multiple due to multicollinearity in the model (Gordon et al., 2009). This research therefore follows McShane et al. (2011). With all the values of VIFS below 2.5 VIP, collinearity is likely to present a problem in the regression analysis

LEV2 were selected. *ERM Scoring* is positive and significantly related to firm value with p-value of 0.001. The better ERM Scoring reflects better ERM implementation; hence, better ERM implementation in the firm has a positive relationship with performance. The control variable that has a significant correlation between *ERM Scoring* and Tobin's Q is leverage (*LEV2*), it has significant negative effect to the model with a p-value of 0.00. Overall stepwise regression model has significant (F-value 8.158, p-value = 0.00) and an adjusted R² of 14.30 percent. The largest VIF is 1.034 for both ERM scoring and *LEV2*. Tobin's Q regression model is suggested as the following equation:

$$\text{Tobin's Q} = 1.04 + 0.141\text{ERM Scoring} - 0.1\text{LEV2} + \epsilon.$$

Table 7.4 ERM and Firm Value – stepwise regression (Tobin's Q)

Variable	Dependent Variable = Tobin's Q		
	Parameter Estimate	White T-Stat.	Sig
<i>Intercept</i>	1.04	7.21	0.00
<i>LEV2</i>	-0.1	-3.4462	0.0009
<i>ERM Scoring</i>	0.141	2.6204	0.0104
N	87		
Adj R2	14.30%		
F- Value	8.158		
Model Significant	0.001		

In Table 7.5, ROE is the performance variable. The result shows that there is a significant relationship between the four variables, *ERM Scoring*, *GROWTH*, *LEV1* and *LEV2*, and ROE (p-values are .046, 0.00, 0.00 and 0.00, respectively). The ROE's regression model has an adjusted R² of 51.60 percent and the largest VIF is 1.334 for *GROWTH*. Therefore, there is no sign of having multicollinearity. Hence, the model for ROE is given in the following equation:

$$\text{ROE} = 0.138 + 3.101\text{ERM Scoring} + 2.96\text{LEV1} - 6.143\text{LEV2} + 33.454\text{GROWTH} + \epsilon.$$

Table 7.5 ERM and Firm Value – stepwise regression (ROE)

Variable	Dependent Variable = ROE		
	Parameter Estimate	White T-Stat.	Sig
<i>Intercept</i>	0.138	0.025	.980
<i>GROWTH</i>	33.454	3.899	.000
<i>LEVI</i>	2.960	4.490	.000
<i>LEV2</i>	-6.143	-6.041	.000
<i>ERM Scoring</i>	3.101	2.024	.046
N	87		
Adj R2	51.60%		
F- Value	23.933		
Model Significant	0.000		

In Table 7.6, ROA is the performance variable. *ERM Scoring* has positive and significant at p-value of .001, indicating that better ERM implementation has a relationship with firm performance for listed companies. The control variables: *LEV2*, *LEVI* and *GROWTH* are found to be significantly associated with ROA (their p-values are .005, .041 and .003, respectively). The overall regression model has significance and an adjusted R² of 31.70 percent and the largest VIF is 1.979 for *LEVI* variable; therefore, there is no sign of having multicollinearity.

$$ROA = 2.327 + 2.433ERM\ Scoring - 0.647LEVI - 1.388LEV2 + 12.206GROWTH + \varepsilon$$

In summary, these results demonstrate that certain different measures of performance – Tobin's Q, ROE and ROA – are positively associated with *ERM Scoring*. Good implementation of ERM is associated with a higher firm value. When control variables are taken into account, *LEV2* was negative and significant to all the various performance measurement in the regression models, which is consistent with Hoyt and Liebenberg (2011) and Beasley et al. (2008), who also find leverage is negatively associated with firm value as a higher default risk. *GROWTH* and *LEVI* are significant on accounting measurements regarding ROA and ROE, but are not included in Tobin's Q as the financial market criteria measurement.

Table 7.6 ERM and Firm Value – stepwise regression (ROA)

Variable	Dependent Variable = ROA		
	Parameter Estimate	White T-Stat.	Sig
<i>Intercept</i>	2.327	0.883	0.38
<i>LEV2</i>	-1.388	-2.887	0.005
<i>ERM scoring</i>	2.433	3.358	0.001
<i>GROWTH</i>	12.206	3.01	0.003
<i>LEV1</i>	-0.647	0.041	0.041
N	87		
Adj R2	31.70%		
F-Value	10.962		
Model Significant	0.000		

7.2.4 Additional Analysis of ERM and Firm Performance

Most of the previous research on ERM and Firm Performance studied only the financial sector, as there is limited ERM research on the non-financial sector (e.g. Quon et al., 2012, Gordon et al., 2009). Since the financial crisis, Standard and Poor's has included a review of ERM in non-financial companies in their rating analysis. Currently, there is a growing interest of ERM thorough all publicly listed companies, not only in the financial sector, but also in the non-financial sector. From the result of ERM Scoring in Chapter 6, it can be found that there is not much variation of ERM practice in financial sector, according to regulatory compliance. All the companies in the financial sector in the sample had an ERM Scoring that ranged from a 4 standard score to a 5 effective practice. Therefore, when this research attempted to study the relationship between ERM and firm performance, the group of listed financial sector companies might have been affected the results. In this study, 71 companies come from the non-financial sector. Using this group they are separately modelled to find the relationship of ERM and firm performance regarding Tobin's Q, ROE and ROA. The results of ERM and firm performance in the non-financial sector can be presented in Table 7.7. Model 2 comparisons to all listed companies result in model 1.

Table 7.7 ERM and firm performance – additional analysis

Variable	Dependent Variable								
	Model 1 (ALL samples)			Model 2 (Non-Financial)			Model 3 (Adj LEV2)		
	Parameter Estimate	White T-Stat.	Sig	Parameter Estimate	White T-Stat.	Sig	Parameter Estimate	White T-Stat.	Sig
Panel A: Tobin's Q is the performance Measure (Tobin's Q)									
<i>Intercept</i>	1.04	7.21	.000	1.18	5.12	.000	.206	1.040	.301
<i>LEV2</i>	-0.1	-3.4462	.001	-0.208	-2.978	.004			
<i>ERM Scoring</i>	0.141	2.6204	.010	0.140	2.391	.020	.107	2.482	.015
<i>LEV1</i>							.036	2.239	.028
<i>LEV2exp</i>							1.569	7.134	.000
Adj R2	14.30%			17.60%			39.40%		
F-Value	8.158			8.604			19.639		
Model Significant	0.001***			0.000***			0.000***		
Panel B: ROE is the performance Measure (ROE)									
<i>Intercept</i>	0.138	.025	.980	15.367	5.033	.000	-18.70	-3.950	.000
<i>GROWTH</i>	33.454	3.899	.000	36.644	4.248	.000	50.181	6.102	.000
<i>LEV1</i>	2.960	4.490	.000	3.290	4.570	.000	2.216	3.673	.000
<i>LEV2</i>	-6.143	-6.041	.000	-12.133	-6.005	.000			
<i>ERM Scoring</i>	3.101	2.024	.046				0.56	0.706	.482
<i>LEV2exp</i>							43.873	5.751	.000
Adj R2	51.60%			58.20%			50.30%		
F-Value	23.933			33.902			30.007		
Model Significant	0.000***			0.000***			0.000***		
Panel C: ROA is the performance Measure (ROA)									
<i>Intercept</i>	2.327	0.883	.380	4.094	1.285	.203	-5.836	-1.962	.053
<i>LEV2</i>	-1.388	-2.887	.005	-3.545	-3.688	.000			
<i>ERM Scoring</i>	2.433	3.358	.001	2.392	2.895	.005	1.946	2.957	.004
<i>GROWTH</i>	12.206	3.01	.003	8.995	2.350	.022	15.925	4.410	.000
<i>LEV1</i>	-0.647	0.041	.041				-0.609	-2.328	.022
<i>LEV2exp</i>							15.908	4.825	.000
Adj R2	31.70%			31.50%			41.40%		
F-Value	10.962			11.904			16.168		
Model Significant	0.000***			0.000***			0.000***		
N	87			71			87		

Table 7.7, Panel A, Model 2, shows the results of the ERM and Tobin's Q model in the non-financial sector. The results show that *ERM Scoring* with *LEV2* are positively significant with Tobin's Q. The result of all the listed companies in the sample is similar, with an adjusted R^2 increase to 17.60 percent. Panel B shows the results of the non-financial sector, where ROE is the performance measure. *LEV1*, *LEV2* and *GORWTH* are significant variables here with an adjusted R^2 of 58.20 percent. *ERM Scoring* is not included in this model. For the ROA regression model in the non-financial sector, *ERM Scoring* with *LEV2* and *GORWTH* are significant, with ROA having an adjusted R^2 31.50 percent. Overall, the result is in line with all listed companies in the sample, except in case of where ROE is the performance measure.

Moreover, it was found that the relationship between *LEV2* and firm performance is similar to an exponential curve. Therefore, to cope with this *LEV2exp* variable, exponential ($-LEV2$) was added. In Table 7.7, the stepwise regression model 3, *LEV2* was transformed to *LEV2exp* variable to ensure that the most appropriate value was used. In Panel A, Model 3, *ERM Scoring* was chosen and had positive significance with Tobin's Q. *LEV2exp* and *LEV1* have positive significance in the model. Overall, the model is significant with a considerably higher adjusted R^2 to 39.40 percent, which is an improvement of explanatory power, compared to using *LEV* as a control variable.

In Panel B, ROE result, Model 3, after including *LEV2exp* as a control variable, *ERM Scoring*, *LEV2exp*, *LEV1* and *GROWTH* have positive significance in the model, with an adjusted R^2 slightly decreased to 50.30 percent, compared to the *LEV* variable model (adjusted R^2 of 51.60 percent). Furthermore, in Panel C, ROA model, when *LEV2* was adjusted to *LEV2exp* variable, it can be found that all significant variables were not changed. The overall model is significant with a higher adjusted R^2 of 41.40 percent. In summary, when *LEV2* is transformed to *LEV2exp* there is a higher adjusted R^2 for both Tobin's Q and ROA regression models.

7.3 Comparison across ERM Methods

Table 7.8 presents the comparative results of predictive models from the ERM methods. To assess the predictive power of ERM methods, adjusted R-square is initially used to test the goodness of fit. Then AIC is used as a criterion instrument for selecting the best predictive statistical model among ERM methods. Table 7.9 shows the result of an AIC comparison of the quality of methods. The selected model is the one that is the most appropriate balance between the statistical goodness of fit and the number of parameters between alternative models. If the number of parameters increase, the value of the AIC index will also be higher. The smallest value of the AIC index shows the best economical model, with adequate degree of fit and the fewest parameters.

In Table 7.8, Panel A, shows Tobin's Q regression model, ERM method and other control variables that were used as independent variables. The all ERM methods model is significant related to Tobin's Q. In Table 7.9, the *ERM PLS* model is significant with the highest adjusted R^2 to 59.30% and p-value 0.00. Similarly, by using the *ERM PLS ALL* variable, based on the combined performance method of PLS in the regression model, the model is significant with a higher adjusted R^2 15.80% and p-value of 0.00, compared to the model using *ERM Scoring* (adjusted R^2 14.30% and p-value 0.00), *ERM Clustering* (adjusted R^2 10.90% with p-value 0.05) or *ERM PCA* (adjusted R^2 13.00% and p-value 0.01). When it comes to which ERM method is the best predictive model of Tobin's Q, then it is clear the lower value of the AIC index is the best predictive model. The AIC index on Tobin's Q, which arranged in order, from the lowest value to highest value, as *ERM PLS*, *ERM Scoring*, *ERM Clustering*, *ERMPLS ALL* and *ERM PCA*. *ERM PLS*, presents the lowest value of AIC index, which showed the best balance of parameters and goodness of fit. The simple ERM Scoring method has the second lowest AIC among all ERM measurement methods.

In Table 7.8, Panel B shows the results of the ROE regression model. Using ROE as a dependent variable with similar control variable, all ERM methods regression models, except for *ERM Clustering* model, are significant related to ROE. In Table

7.9, the *ERM PLS* model shows the best model fit among the four models with the highest adjusted R^2 58.70% and p-value 0.00, compared to the model using *ERM Scoring* (adjusted R^2 51.60% and p-value 0.00), *ERM Clustering* (adjusted R^2 49.80% and p-value 0.00), *ERM PLS ALL* (adjusted R^2 33.90% and p-value 0.00) and *ERM PCA* (adjusted R^2 32.90% and p-value 0.02). When the quality of the models measurement is considered, using the AIC index, *ERM Scoring* seems to have the lowest value of the AIC index. The AIC index, from lowest value to highest value correspondingly, is presented as follow: *ERM Scoring*, *ERM Clustering*, *ERM PLS*, *ERM PLS ALL* and *ERM PCA*. *ERM Scoring*, which is a simple equally weight measurement, represents the best variable predictor amongst the four scoring methods, over PLS, clustering and the PCA method.

In Table 7.8, Panel C, all ERM methods of regression models are significant with ROA in the ROA regression model. The predictive quality of the ROA model is shown in Table 7.9, and the *ERM PLS* model has the highest goodness of fit with adjusted R^2 46.10% and p-value 0.00. *ERM PLS ALL* has the second highest percentage of adjusted R^2 41.10% compared to *ERM PCA* (adjusted R^2 38.90% and p-value 0.00), *ERM Scoring* (adjusted R^2 34.60% and p-value 0.00) and *ERM Clustering* (adjusted R^2 29.30% and p-value 0.05). However, when balancing the number of parameters and goodness of fit of each model in the AIC index, *ERM Scoring* has the lowest value of AIC, capturing the best quality of the predictive model. The quantity predictive model, when using ROA as the predictor, has an order similar to the ROE range from *ERM Scoring*, *ERM Clustering*, *ERM PLS*, *ERM PLS ALL* to *ERM PCA*, respectively.

Table 7.8 also presents the coefficients of stepwise regression, predicting the firm performance measures Tobin's Q, ROE and ROA – by using the ERM method and control variables. Given the single sample results, a 10-fold cross-validation has been employed to explore reliability (e.g. Akkoç, 2012, Finlay, 2010, Kim and Sohn, 2004). Amongst all of the ERM measures, the mean of the coefficient standard error of 10-fold cross-validation ranged from 0.00 to 2.90. The highest values for the standard error were for ROE, except in the case of *ERM Scoring*, which had the smallest value by some margin. *ERM Clustering* was also not significant for ROE.

Although, *ERM Scoring* is a simple procedure for measuring ERM, when it is used to compare various scoring methods, *ERM Scoring* performs well compared to other ERM measurement methods. It has the lowest AIC in both the ROE and ROA models and also represents the second lowest AIC in Tobin's Q model. The PLS model shows the highest goodness of fit amongst these three firm performance measurements because the *ERM PLS* method takes into account both the ERM variable and a firm performance (dependent variable). Meanwhile, other ERM method have been constructed, based on ERM variables. Therefore, it is no surprise that *ERM PLS* has the highest goodness of fit, but when the AIC index is considered, *ERM PLS* only gain the most powerful predictive in the case of TOBIN'S Q, and prove less predictive than the simple *ERM Scoring* method in some cases of ROA and ROE. Meanwhile, *ERM PCA* has the least predictive ability (the highest AIC) amongst four models, according to dimension reduction of the PCA that only captures the amount of the total variance in the main components. Overall, it can be concluded that the *ERM Scoring* method performs well in comparison with others on the basis of the relationship with company performance, when taking into accounting control variables.

Table 7.8 Comparison of ERM methods and firm performance – stepwise regression

Variable	Dependent Variable														
	ERM Scoring			ERM Clustering			ERM PCA			ERM PLS Separated Performance			ERM PLS ALL Combined Performance		
	Parameter Estimate	10fold SE.	Sig	Parameter Estimate	10fold SE.	Sig	Parameter Estimate	10fold SE.	Sig	Parameter Estimate	10fold SE.	Sig	Parameter Estimate	10fold SE.	Sig
Panel A: Tobin's Q is the performance measure (Tobin's Q)															
<i>Intercept</i>	1.04	0.01	0.00	1.13	0.07	0.00	1.48	0.01	0.00	1.05	0.01	0.00	1.11	0.02	0.00
<i>LEV2</i>	-0.10	0.00	0.00	-0.09	0.00	0.00	0.09	0.00	0.00	-	-	-	-0.95	0.00	0.00
<i>ECON</i>	-	-	-	-	-	-	-	-	-	-2.66	0.36	0.01	-	-	-
<i>ERM measure</i>	0.14	0.01	0.01	0.14	0.01	0.05				0.79	0.02	0.00	0.49	0.03	0.00
<i>ERM PCA</i>							0.19	0.01	0.01						
<i>ERM PCA5</i>							0.20	0.01	0.01						
Panel B: ROE is the performance measure (ROE)															
<i>Intercept</i>	0.14	1.95	0.98	10.13	2.17	0.00	9.23	6.31	0.01	-10.10	4.95	0.01	-4.71	5.86	0.46
<i>GROWTH</i>	33.45	1.34	0.00	37.31	1.40	0.00	55.59	2.77	0.00	33.40	1.06	0.00	54.12	2.51	0.00
<i>LEV1</i>	2.96	0.32	0.00	2.89	0.32	0.00	-	-	-	-	-	-	-	-	-
<i>LEV2</i>	-6.14	0.25	0.00	-5.74	0.27	0.00	-3.58	0.53	0.00	-2.98	0.37	0.00	-3.51	0.49	0.00
<i>ERM measure</i>	3.10	0.62	0.05							55.72	2.90	0.00	18.10	1.86	0.01
<i>ERM PCA</i>							7.20	1.12	0.02						
Panel C: ROA is the performance measure (ROA)															
<i>Intercept</i>	2.33	0.27	0.38	2.18	0.52	0.45	9.20	0.57	0.00	2.33	0.72	0.21	1.78	0.17	0.45
<i>LEV2</i>	-1.39	0.10	0.01	-1.72	0.10	0.00	-	-	-	-	-	-	-	-	-
<i>GROWTH</i>	12.21	0.08	0.00	7.82	1.32	0.03	19.42	0.88	0.00	15.16	2.27	0.00	17.86	1.86	0.00
<i>LEV1</i>	-0.65	0.09	0.04	-	-	-	-1.69	0.14	0.00	-1.25	0.21	0.00	-1.61	0.18	0.00
<i>ERM measure</i>	2.43	1.60	0.00	2.85	0.14	0.00				13.51	0.91	0.00	9.71	0.25	0.00
<i>ERM PCA</i>							3.83	0.20	0.00						
<i>ERM PCA5</i>							2.57	0.44	0.03						

Table 7.9 Quality of models measurement – The Akaike Information Criterion (AIC)

	<i>ERM Scoring</i>	<i>ERM Clustering</i>	<i>ERM PCA</i>	<i>ERMPLS</i> Separated Performance	<i>ERM PLS ALL</i> Combined Performance
Adj R²					
TOBIN Q	14.30% (0.87%)	10.90% (0.94%)	13.00% (0.67%)	59.30%*(0.67%)	15.80% (0.92%)
ROE	51.60% (2.24%)	49.80% (2.12%)	32.90% (3.04%)	58.70%* (0.90%)	33.90% (2.56%)
ROA	34.60% (1.33%)	29.30% (1.19%)	38.90% (1.38%)	46.10%* (1.79%)	41.10% (1.39%)
*the maximum adjusted R ² in each row					
Model Sig					
TOBIN Q	0.00	0.05	0.01	0.00	0.00
ROE	0.00	0.00	0.02	0.00	0.00
ROA	0.00	0.00	0.00	0.00	0.00
AIC					
TOBIN Q	178.127	181.108	186.103	116.235*	183.12
ROE	764.548*	766.788	1088.022	831.636	874.816
ROA	631.276*	637.065	690.96	679.396	687.65
* the minimum AIC value in each row					

7.4 Results on the Determinants of ERM Implementation

7.4.1 Description of Variables Measures

To explore the influence of ERM determinant, the ordinal logistic regression model is used in the analysis. The empirical model is as follows:

$$ERM\ Scoring = f(SIZE, LEV, REPUT, GROWTH, TECH, MARKET, INCOME\ and\ ECON,)$$

where the *ERM Scoring* variable is now the regressand. The definition and expected signs are shown in Table 7.10.

7.4.2 Univariate Statistics Categorised by ERM Scoring

Table 7.11 shows univariate statistics on the variable used in the regression model, which includes the mean value and standard deviation of each *ERM Scoring* category. Sixty-one percent of the sample (N=53) are categorised in the ERM standard and ERM effective level (ERM score 4 and 5), while 39 percent (N=34) of listed companies in the sample are at a traditional risk management level to start implementing the ERM program level (ERM score 1 to 3). Most of the determinants in ERM score 5 (effective ERM level) have the highest mean in firm size, leverage, reputation and economic factor. There is the same pattern in the ERM score of 1 (no or weak risk management level), which has the highest mean in sale uncertainty and technology uncertainty, as predicted.

Table 7.12 shows the Pearson correlation coefficient. The signs of the correlation of the determinant ERM variables are as expected. There is no correlation above 0.5 amongst the independent variables. Co-linearity is therefore unlikely to be a problem in the regression analysis.

Table 7.10 Variable measures: Determinant of ERM

Variable Name	Expected Sign	Definition	Data source
ERM implement stage (<i>ERM Scoring</i>)		The proposed ERM score for each company	Survey Collection
Firm Size (<i>Size</i>)	+	Log (book value of asset)	Setsmart Database ⁸
Leverage (<i>LEV</i>)	+	Leverage (total liabilities divided by the market value of equity)	Setsmart Database
REPUTATION (<i>REPUT</i>)	+	Number of years since incorporation for firm <i>i</i>	DataStream (WC18272)
GROWTH (<i>GROWTH</i>)	+	(Sales _{<i>t</i>} - Sales _{<i>t-1</i>}) / Sales _{<i>t-1</i>}	Setsmart Database
Technology Change (<i>TECH</i>)	+	Coefficient of variation of the sum of capital Expenditures (5 years)	COV (sum of 5 year DataStream (WC04601))
Market Uncertainty (<i>MARKET</i>)	-	Coefficient of variation of sales (5 years)	COV (sum of 5 year DataStream (WC01001))
Earning Volatility (<i>INCOME</i>)	-	Coefficient of variation of net income before taxes (5 years)	COV (sum of 5 year DataStream (WC01401))
GPD (<i>ECON</i>)	+	Percentage change of Domestic Production by sector	Bank of Thailand
<u>Additional Variable</u>			
BIG4 (<i>BIG4</i>)	+	The presence of a Big Four auditor	Annual Report
Institute Ownership (<i>INSTITUTE</i>)	+	The percentage of the firm's stock held by institutional investors	Setsmart Database

Note: ERM = Enterprise Risk Management. This Table provides the definition and expected sign for each variable.

⁸ SETSMART Extranet is an information database system developed by the Stock Exchange of Thailand. The service is a comprehensive source of information that integrates real-time information, historical trading prices and indices, listed companies information and news, and key statistical information.

Table 7.11 Univariate statistics categorised by ERM Scoring: Determinant of ERM

Variable	<i>ERM Scoring</i>									
	1 (N=12)		2 (N=11)		3 (N=11)		4 (N=25)		5 (N=28)	
	<i>MEAN</i>	<i>SD.</i>	<i>MEAN</i>	<i>SD.</i>	<i>MEAN</i>	<i>SD.</i>	<i>MEAN</i>	<i>SD.</i>	<i>MEAN</i>	<i>SD.</i>
<i>Size</i>	6.36	0.46	6.79	0.59	6.4	0.46	7.12	0.79	7.69	1
<i>LEV</i>	1.38	1.89	1.17	0.99	0.88	0.76	1.44	1.37	2.85	3.91
<i>REPUT</i>	25.58	15.41	29.45	13.56	24.45	14.2	23.92	20.14	31.43	25.24
<i>GROWTH</i>	-0.15	0.31	0.09	0.33	0.2	0.41	0.2	0.2	0.1	0.21
<i>TECH</i>	0.75	0.39	0.57	0.36	0.66	0.34	0.61	0.42	0.51	0.26
<i>MARKET</i>	0.27	0.19	0.24	0.19	0.27	0.18	0.23	0.22	0.16	0.09
<i>INCOME</i>	1.76	1.76	0.51	1.68	-0.11	3.4	1.65	4.2	2.06	5.85
<i>ECON</i>	0.01	0.03	0.01	0.04	0	0.04	0.03	0.04	0.04	0.05

Note: This Table provides the mean value for the variable for all samples in each ERM Scoring category. All variable definition are provided in Table 7.10.

Table 7.12 Pearson Correlation Coefficients Correlations: Determinant of ERM

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
<i>ERM</i>									
(1) <i>Scoring</i>	1.000								
(2) <i>Size</i>	.504**								
(3) <i>LEV</i>	.218*	0.033							
(4) <i>REPUT</i>	0.067	.314**	-0.163						
(5) <i>GROWTH</i>	.241*	-0.159	0.018	0.184					
(6) <i>TECH</i>	-0.184	-.376**	0.022	-0.160	-0.176				
(7) <i>MARKET</i>	-0.201	-0.018	-0.041	-0.052	-0.029	.371**			
(8) <i>INCOME</i>	0.082	0.090	-0.015	0.056	-0.101	-0.028	-0.146		
(9) <i>ECON</i>	.271*	.243*	0.026	0.113	-0.015	-0.025	0.120	0.149	1.000

The Pearson correlation coefficients are above the diagonal and the Spearman rank correlation coefficients are below the diagonal. Significant coefficients at the 1%, 5% and 10% levels are noted by ***, ** and *, respectively.

7.4.3 The Determinant of ERM – Ordinal Regression

Table 7.13 shows the regression results. ERM determinant variables in the model are significantly related to the different levels of *ERM Scoring* with model Chi-square = 42.26 and p-value of 0.00 with a Pseudo R-square of 40.4%. It would appear that several variables are related to ERM implementation.

The higher level of *ERM Scoring* is positively related to firm size (*SIZE*) with p-value of 0.000, so larger firms are associated with better ERM implementation. This finding possibly suggests that larger firm tend to implement ERM because they have the resources and willingness to organise appropriately their risk management system. This result corresponds with Hoyt and Liebenberg (2011) and Pagach and Warr (2011). Moreover, it can be found that economic factors (*ECON*) are also associated with the extent of ERM implementation with p-value 0.032. Firms that operated in sectors with high GDP are more likely to develop better ERM implementation. The variance of sales represents market uncertainty and companies with less variance should have a more effective ERM implementation. There are significant negative relationship between market uncertainty (*MARKET*) and the level of effective risk management system with p-value 0.006. From the study, it can be concluded that firm size (*SIZE*), economic factor (*ECON*) and market uncertainty (*MARKET*) are the three most influential factors in the ERM stage of adoption.

Moreover, this study also considers the impact of other variables that might influence the determinants of ERM. Additional variables were explored to find the determinant of ERM implement level, and the effect of institute ownership (*INSTITUTE_OWN*) is used as the first additional factor. This factor was found positively significant in the studies of Hoyt and Liebenberg (2011) and Pagach and Warr (2011), but not influential in the studies of Golshan and Rasid (2012) and Razali et al. (2011). These results are based on proxy of the ERM measurement method. Moreover, the studies of Beasley et al. (2005) use the proxy of the presence of the Big Four auditors (*BIG4*) as a reputation variable; therefore, the *BIG4* variable is added to the regression model. None of these variables are significant.

Table 7.13 Ordinal logistic regression results: Determinant of ERM

	Variable	Expected Sign	Coefficient	Std. Error	Wald's test	p-Value
Threshold	<i>ERM SCORING</i> =					
	1.00		7.331	2.157	11.550	.001***
	= 2.00		8.331	2.183	14.569	.000***
	= 3.00		9.137	2.213	17.046	.000***
	= 4.00		10.874	2.304	22.274	.000***
Variable	<i>Size</i>	+	1.422	.316	20.202	.000***
	<i>LEV</i>	+	-.003	.119	.001	.979
	<i>REPUT</i>	+	-.009	.011	.758	.384
	<i>GROWTH</i>	+	.960	.734	1.709	.191
	<i>TECH</i>	+	.887	.672	1.741	.187
	<i>MARKET</i>	-	-3.696	1.354	7.451	.006***
	<i>INCOME</i>	-	-.008	.060	.018	.894
	<i>ECON</i>	+	10.175	4.738	4.611	.032**
	N		87			
	Pseudo R square		40.4%			
	Sig		0.00			

Note: Significant coefficients at the 1%, 5% and 10% levels are noted by ***, ** and *, respectively.

7.5 Conclusion

The goal of the ERM is to help improve firm performance by effectively managing their related risks. Furthermore, credit rating agencies employ the ERM system as a factor in the company rating for both financial and non-financial firms. Since the financial crisis, many firms attempted to develop their ERM system hoping that it would serve as a business protocol that would ensure their survival in an increasingly volatile business world. Does ERM enhance value? If it does, what are the determinants of the success of ERM implementation? These two questions are the challenges tackled in this Chapter.

Although, previous research has attempted to study the impact and relationship of ERM and firm performance, the results are still inconclusive. One of the main limitations facing researchers is the inability to identify a firm's engagement with ERM. Moreover, most ERM and firm performance studies involve companies in the

insurance sector. The difficulty has been that there appears to be a lack of an ERM Score to measure the effectiveness of ERM implementation for companies.

Using the proposed reliable ERM Scoring method developed in a previous chapter, it is possible to use it as a measure of ERM implementation to explore the relationship between ERM implementation level and firm performance.

By using the control variables mentioned in the previous literature and employing stepwise regression, it is possible to establish the relationship between ERM implementation and firm performances. The empirical results show that a better-implemented ERM program has a positive relation with firm value. The higher ERM Scoring is statistically significantly positive, correlated with better contemporaneous in both market valuation (Tobin's Q) and accounting valuation (ROE and ROA). In addition, the lower amount of leverage is also significantly positive to ERM with all performance measurement. Hence, it reduces the difficulty in paying off its financial obligations, such as financial default. Sales growth also has a statistically positive relationship with ERM and return on equity or return on asset, owing to it creating opportunities for investments.

Linear stepwise regression analyses of the relationship of ERM and firm performance, which take into accounting control variables, is used to compare the models across ERM methods. The proposed ERM Scoring method is compared to three potential alternatives approaches: Clustering approach, PCA procedure and PLS analysis. This comparison is made by examining the predicted behaviour of firm performance, along with the control variables. The ERM Scoring method performs well in comparison with others. Therefore, the ERM Scoring method that is proposed in the study is appropriately represented as a measure of ERM implementation.

Using the proposed ERM Scoring as a measure of effective implementation, it has been possible to explore the determinants of effective ERM implementation. The results confirmed that a firm's size, market uncertainty and the gross domestic product by sector seem to determine how successful ERM implementation is. The larger the firm size and the higher the GPD is by sector, significantly increases the

success of ERM implementation. In addition, companies with less sales variance have a more effective ERM implementation than those with more sales variance.

The above findings have important implication for researchers, policy makers and cooperate boards. A reliable measure of ERM implementation has been constructed and proposed in this study. It can be used to study the relationship of ERM and firm performance and also to determine the factors that influence successful implementation of ERM. This study has shown that ERM implementation does have a positive effect on firm performance, and ERM implementation is beneficial for listed companies, not only those in the financial sector but also in the non-financial sector.

Chapter Eight

Conclusion

This Chapter summaries the research findings and discusses the limitations, as well as proposing possible directions for further research. The Chapter begins by summarising the main research objectives. Following the objective of research, key research findings are presented. Finally, limitations in this study are pointed out and directions for future research are suggested in the final part.

8.1 Objectives of Research

Enterprise Risk Management (ERM) may be an effective tool to manage risk within a business that enables the business to achieve their company's objectives. Recent world crises have put management of risk as a top priority for most firms. ERM may be an effective way to achieve this goal. Regulators and financial consultants also support ERM initiation and implementation and believe it should be beneficial for most companies. The goal of the ERM is to help and improve a firm's performance by effectively managing their related risks.

Furthermore, credit rating agencies assess risk by using ERM as a standard factor when rating a company for both financial and non-financial firms. More than half of listed companies worldwide, however, are still in the process of implementing ERM. Thus far, the studies on ERM effectiveness can still be regard as inconclusive in enhancing firm performance. Hence, this inconclusiveness may not convince a firm whether ERM adoption can benefit its value creation. In addition, the effectiveness of ERM implementation can be limited by a lack of understanding about the factors that influence the success of ERM within organisations. The main problem with ERM implementation is the lack of a unified definition of what an ERM framework is, as well as inconsistency about the description of it and limitations in effectively measuring ERM implementation levels. These problems have led to conclusions by many researchers that previous ERM studies were of insufficient quality to present adequate results, and therefore have made it difficult to conduct empirical research

on the subject (Mikes and Kaplan, 2013, Kraus and Lehner, 2012, Nielson et al., 2005). Therefore, the aim of this research was to address the following objectives:

1. To review various ERM definitions and frameworks and to develop an understanding of key features of ERM implementation within listed companies.
2. To develop possible approaches to measuring ERM implementation and evaluate their predictive accuracy.
3. To explore current stage of ERM implementation in Thailand's Listed Companies.
4. To examine whether the implementation of ERM increases financial performance.
5. To examine which characteristics of a firm influence successful ERM implementation.

8.2 Proposed ERM definition and the components of effective ERM adoption

An extensive review of literature on past ERM frameworks was investigated. The lack of a consistent and unified definition of ERM has led to a problematic situation for both the practitioner and researchers. There are various frameworks that have been specified by international organisations, such as the COSO (2004), CAS (2003), ISO 31000 (2009) and Standard & Poor ERM (2005 and 2013). Therefore, a unified ERM definition and its components are proposed in this study by reviewing previous literatures. The proposed ERM definition is:

“An integrated framework or the process of managing the interdependencies between the company-wide risk; by which the company needs to create a well-organised risk governance and culture. This includes identifying, measuring, managing and disclosing all key risks by supporting employees across all levels of the firm through effective information, communication and staff training in order to increase business performance, organisational effectiveness and value to stakeholders.”

In addition, a set of key ERM components was derived from current ERM frameworks. The 40 components can be divided into 6 categories: 1) fundamental ERM; 2) the existence of ERM evidence; 3) the risk management structure and architecture; 4) risk management policy and risk appetite; 5) responsibilities and accountability; 6) the risk management process, including identifying and managing risk; communication; training and knowledge development; technology and monitoring. These components can lead to best practice in ERM. Therefore, the finding in this section achieved the first research objective.

8.3 Developing a possible approach for a method of ERM measurement and predictive accuracy

This study proposes an ERM scoring approach to measure ERM implementation by assessing the component elements of ERM directly. This has distinct advantages over previous approaches, which have used either proxies or accounting methodologies. To demonstrate its viability, data was collected from publicly listed firms in Thailand and used to test the ERM scoring approach by comparing it with three different approaches: cluster analysis, principal components analysis (PCA) and partial least square analysis (PLS). The proposed method did well compared to the alternatives, both statistically and in its prediction performance. Hence, a reliable measure of ERM implementation was obtained that can be used for more robust studies of ERM. Therefore, the finding in this section achieved the second research objective.

8.4 The current stage of ERM practice in Thailand

This study of ERM practices in Thailand – one of the important countries in the emerging market – is timely given the increasing expectation that is being placed on effective risk management system from the market in South East Asia. The formation of AEC gives rise to highlighting of performance of companies within ASEAN. In Thailand, there is no regulation that obliges listed companies to implement the risk management process. Since 2004, Securities and Exchange Commission Thailand has only suggested that Thai publicly Listed Companies in the Stock Exchange of Thailand should follow COSO ERM guidance. The key objective of this study was to

identify the current stage of corporate risk management and the next practical step in creating effective ERM within enterprises in Thailand.

Based on the sample, the better the ERM score, the more components associated with ERM practice are implemented. The results found that all of the companies in the sample realise the benefits of risk management, but those with a better ERM score saw risk management as value creation, more than those companies with a lower ERM score. In addition, any discussion about risk management through a strategic planning process should be set up on a quarterly basis and involve the risk management committee, top management and management committee, as many high scoring ERM companies currently do. Moreover, the risk management structure, which was based on the results of companies from the higher ERM score in order to gain an efficient risk management structure, suggested that a risk management department or unit should be established and directly report to the risk management committee. This not only should directly reports to the Board of Directors, but also reports risk-related information to the CEO. The Board of Directors has still the most important role in ERM implementation.

When considering the existence of risk management evidence, most companies with an ERM score of 5 prepared and reviewed most of the suggested risk management documents, including their risk management policy, risk register, risk management framework, risk tolerances, business continuity plan, especially in crisis management, risk appetite and self-control assessment. After the preparation of these ERM documents, the reviewing process is also important in order to achieve effective ERM implementation.

To achieve a better ERM score, it is suggested that the risk management process is improved as follow:

1. Risk management should be embedded into the business process as a corporate culture.

2. Besides the type of risks recommended by COSO ERM (2004), operation risk, financial risk, compliance risk and strategic risk, reputation risk should also be considered.

3. Risk management training should be expanded throughout the company to increase employees' knowledge about the subject, not only for director and management level, but also for all staff.

4. Techniques, such as early warning indications, benchmarking against policy or best practice, as well as balanced scorecards and KPI measurement, should be established for the effective monitoring of the risk management system.

Therefore, the finding in this section achieved the third research objective.

8.5 Examining ERM and Firm Performance

The aim of this research is to find out whether ERM implementation impacts on a firm's performance. Past studies have shown there is no consensus on whether ERM does increase firm performance, as has been advocated by regulators, business advisors and others. So the issue still exists as to whether ERM implementation has been adequately assessed. A reliable ERM scoring system is proposed and then compared to firm performance by using a sample of firms from publicly listed firms in Thailand. The relationship between the proposed measure and firm performance is then considered by taking account of appropriate of control variables. It was found that implementing ERM can improve firm performance in term of Tobin's Q, ROE and ROA. Therefore, the finding in this section achieved the forth research objective.

8.6 Exploring the influences and determinants of ERM adaptation

Many companies have set up ERM initiatives, but they lack a clear understanding of the factors that will lead to successful ERM implementation. This study aims to provide insight into the influential factors that are crucial in ERM implementation. Ordinal regression models are employed to determine the relationship between the derived scores and the attributes of the organisations. The empirical results show that a firm's size and economic factors have a statistically positive relationship with high

level of ERM implementation, while lower ERM scores have more revenue volatility than those that implement ERMs well. Therefore, the finding in this section achieved the last research objective.

8.7 Limitations and Future Research

Due to the data availability and resources, there are some limitations in this research. These will be discussed in the following part, as well as suggested future research.

8.7.1 Extending a proposed ERM measurement approach in other economic regions

Thailand was chosen in order to establish the viability of the approach and to carry out an empirical study, given the accessibility to the required data. In addition, there is the need for listed companies in Thailand to provide reassurance about their management of risk in the current context, with the emergence of the AEC, which is the development of an economic trading block amongst ASEAN countries. Hence, the companies listed on the Stock Exchange of Thailand provided an ideal study of ERM implementation. Therefore, the result of this study can only lead to conclusions within the context of Thailand, which might constrain the generalisation of the findings to other countries. Although the sample size of this study is around 20 percent of all Thai List Companies, there are only 87 companies in the sample used.

This study provides an approach that could be employed more generally with studies of ERM in other economic regions. Future research could extend the work to broader range of firms. The larger the sample size, the greater the demonstration that the results are statistically robust. It would be interesting to explore the data from other countries in order to assess whether there would be differences in the resulting analyses.

8.7.2 Alternative unequal weights approaches

By synthesising the various guidelines, it has been possible to identify the key components that are consistent with the ERM implementation. In this study, 40 such components were identified. Using a simple aggregate score, it is therefore possible

to derive a scoring methodology that has been shown to be comparable to other multivariate techniques.

Whilst the proposed method uses equal weights, it would be possible to consider other weightings. At this stage, however, it would have been arbitrary to use unequal weights. It would obviously be possible to consider the weightings given by the alternative multivariate techniques used, but that might have given the proposed methodology an unfair advantage. This may be investigated in further studies.

8.7.3 Taking into Account Corporate Governance Factors

Corporate governance gained considerable attention and has become mandatory for Listed Companies in the period after SOX. There is currently significant discussions about corporate governance and ERM practice around the perceptions of value creation (Bhimani, 2009). Corporate governance, however, was out of scope of this thesis, due to funding and time constraints.

It might be a good idea to extend future research to study the relationship between a proposed ERM measurement method and corporate governance factors in the firm performance. This would enable the researcher to establish whether there is a correlation between ERM, corporate governance and value creation.

The topic of ERM is important for businesses and how they achieve success in the 21st century, which calls for more research to further develop this research field. Based on a reliable ERM scoring method, the author hopes that this thesis has provided an important study for further research.

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Appendices

Appendix A:

Summary of ERM and Firm Performance Academic Research: Updated from original study of Kraus and Lehner (2012)

Authors	What was examined and the time period of the study	ERM Proxy	Firm Performance measurement	Finding
1. Proxy Search				
Hoyt and Liebenberg, 2011	<p>Measurement of the extent to which specific firms have implemented ERM programs and the value implications of these programs</p> <p>Data: 117 publicly traded U.S. insurers drawn from CRSP/Compustat database for the period 1998-2005 (SIC Code 6311 and 6399); 687 firm-year observations for the 8- year period</p>	<p>Proxy search: "Enterprise Risk Management", "Chief Risk Officer", "Risk Committee", "Strategic Risk management", "Consolidated Risk Management", "Holistic Risk Management", "Integrated Risk Management"</p>	<p>Tobin's Q as the market value of equity plus the book value of liabilities divided by the book value of assets</p>	<p>Univariate result: value of Tobin's Q is higher for firms with ERM (approx. 4%); ERM user is larger, less leveraged, less opaque, has less financial slack, lower return volatility, higher levels of institutional ownership and relies less on reinsurance than the average nonuser; Results maximum-likelihood treatment effects model: variables Size, Leverage, Opacity, Institutions, Reinsurance, Value Change, Diversification International and Life are significantly related to ERM engagement; Insurers engaged in ERM are valued higher (approximately 20%) than other insurers</p>

<p>Nocco and Stulz, 2006</p>	<p>Examination how enterprise risk management creates value for shareholders and the practical issues that arise in the implementation of enterprise risk management</p> <p>Data: Not defined</p>	<p>Not defined</p>	<p>Not defined</p>	<p>ERM creates value at a “macro” or company-wide level and a “micro” or business-unit level; macro level: creates value by quantifying and managing the risk-return trade-off of the entire firm, helps the firm maintain access to the capital markets for implementing its strategy, reducing non-core risks; micro level: risk-return trade-off evaluated for all corporate decisions (decentralisation), every risk is owned, risk-based capital allocation and performance evaluation; optimal level of risk: trade-off between managing risk and holding more equity to absorb costs of financial distress; ERM reduces probability of financial distress, managing risk should be less costly than holding more equity; ERM implementation: identify all risks (top-down and bottom-up), measure the risk exposure, aggregate all individual risks to a firm-wide risk profile; target accounting-based ratios as determinants of ratings; take account of risk</p>
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				correlations; equity capital set should base on a VaR estimate; evaluation of ERM
Eckles et al., 2014	Testing the impact of ERM adoption on firms' risk taking behaviour by testing the hypothesis that practicing ERM reduces firms' cost of reducing firm risk; lowers the marginal cost (MC) of reducing risk, which creates incentives for profit-maximising firms to reduce total risk while increasing firm value Data: 69 publicly-traded insurance companies in the US drawn from CRSP/COMPUSTAT database from 1990 to 2008	Proxy search: "Chief Risk Officer", "Enterprise Risk Management", "Enterprise Risk Officer", "Strategic Risk Management", "Integrated Risk Management", "Holistic Risk Management", "Consolidated Risk Management"	Risk reduction & Profit increase; reduction in firm's total risk measured by the log of the annualised standard deviation of daily stock returns (stock return volatility as proxy for firm risk, because it is a well-establish measure for a firm's total risk); profit increase is measured by ratio of Return on Asset (ROA) to firm risk post-ERM adoption (ratio of ROA over annualised standard deviation of stock returns) (Alternative definitions of profits used, including return on book value of common equity and return on market value of common equity)	Firms adopting ERM experience a reduction in stock return volatility; due to costs and complexity of ERM implementation, it is also found that the reduction in return volatility for ERM-adopting firms become stronger over time; operating profits per unit of risk (ROA/return volatility) increase post ERM adoption
Beasley et al., 2008	Examination of equity market reactions to announcements of senior executive officers appointments and the impact of firm-specific characteristics on the magnitude of equity market response Data: 120 public listed companies with CRO announcements from 1992-2003 in	Proxy search: Appointment of a CRO or equivalent as signal adoption of ERM; search string contained "announced", "named", or "appointed" in conjunction with position descriptions of "chief risk officer" or "risk management"	Stock market reaction surrounding the appointment of a CRO measured by cumulative abnormal return (event period as the day of the hiring announcement plus the following day; the abnormal return is computed using a three factor market model estimated	Univariate average two-day market response is not significant, a general statement about the benefit or cost of ERM is not possible; Multivariate analysis: in general: firms with large cash reserves are less likely to benefit from ERM, the extent of growth

	U.S.		over the -255 to -46 day window prior to the announcement; three factors: market return proxied by the CRSP equally weighted index, book-to-market and size)	opportunities, holdings of intangible assets, recent earnings volatility and capital structure have no impact on value creation, larger firms are more likely to benefit from ERM; financial-firms: firms with less cash and more leverage are more likely to see benefits from ERM, reduction in beta is associated with a positive price reaction; non-financial firms: market returns are positively associated with the firm's prior earnings volatility and size, negatively associated with the extent of cash on hand and leverage, no statistical association between returns and the firm's growth, extent of intangible assets, or change in beta; results suggest: costs and benefits of ERM are firm-specific
Pagach and Warr, 2010	Study of the effect of ERM implementation on firms' long-term performance by focusing on how risk, financial, asset and market characteristics change around the time of ERM adoption	Proxy search: Hiring announcements of enterprise-level or chief risk officers (CRO) as a signal for ERM adoption; proxies used were "announced", "named", or "appointed", in	Earnings volatility (standard deviation of the error term from a regression of the firm's quarterly earnings on the prior quarter's earnings) and stock price volatility (standard deviation of	Significant decline in the standard deviation of stock returns for the CRO firms; no significant change in the earnings volatility, no leverage increase, no size increase due to ERM adoption;

	<p>Data: 106 publicly traded companies with announcements of senior risk officer appointments from 1992-2004</p>	<p>conjunction with position descriptions such as “chief risk officer” or “director of risk management”; initial sample search included “title” terms like Chief, Director, Vice President, President, Head, Managing Director, Manager, General Manager</p>	<p>the firm’s daily returns over the year prior to the hiring of the CRO); leverage (total liabilities to assets); accounting return (return on equity= net income/book equity); financial slack (proportion of the firm’s assets that are cash or cash equivalents); opacity (ratio of intangibles to total assets); growth (market-to-book (MB) ratio and research and development expense)</p>	<p>results fail to find support for the proposition that ERM is value creating</p>
<p>Tahir and Razali, 2011</p>	<p>Estimating the relation between ERM and firm value in the Malaysian public listed companies</p> <p>Data: 528 public listed companies from Malaysia in 2007</p>	<p>Proxy search: Enterprise Risk Management, dummy variable 1 = practice ERM and 0 otherwise</p>	<p>Tobin's Q as the market value of equity plus the book value of liabilities divided by the book value of assets</p>	<p>Descriptive statistics: 29.7% are ERM-user; ERM has no impact on firm value; Regression results: ERM is positive but not significant with firm value;</p>

2. ERM Rating from Standard and Poor's

<p>Lin et al., 2012</p>	<p>Investigation whether the heterogeneity in Individual Risk Management practices (IRM: hedging, insurance, etc) across firms accounts for their different propensities toward adopting ERM (Considering that ERM integrates IRMs). Analysing the patterns of IRM adjustments subsequent to ERM adoption; Examination of influence of ERM on firm performance in the context of IRMs</p> <p>Data: 507 observations for 85 publicly traded property and casualty (PC; SIC code 6331) insurers in the U.S. market during 2002 - 2007</p>	<p>Two variables: Proxy search: “Enterprise Risk Management”, “Chief Risk Officer”, “Risk Commit-tee”, “Strategic Risk Management”, “Consolidated Risk Management”, “Holistic Risk Management”, and “Integrated Risk Management” (as dummy variable) AND Standard and Poor’s RM Quality Scale ERM1 = Weak; ERM2 = Adequate; ERM3 = Strong; ERM4 = Excellent (Standard & Poor's, 2006)</p>	<p>Benefits: reinsurance costs (Ratio of reinsurance ceded to sum of direct business written and reinsurance assumed), asset portfolio volatility (Annualised volatility of assets estimated from seven asset return series from 1991Q1 to 2007Q4), cost of financial risk measured by derivative usage (Notional amount of all derivative positions for hedging purpose held at year end, normalised by total assets); Tobin's Q (market value of equity plus the book value of liabilities divided by the book value of assets) & return on asset (ROA) (Net income divided by total assets) & Underwriting ROA (underwriting income divided by total assets)</p>	<p>ERM show a strong negative correlation with firm value with a discount of 5% (4%) in terms of Tobin's Q (ROA).</p>
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<p>McShane et al., 2011</p>	<p>Investigation of the relationship between the degree of implementation of ERM implementation and firm performance, using Standard and Poor’s newly available risk management rating</p> <p>Data: 82 publicly traded U.S. insurers for which S&P released 2008 an ERM rating</p>	<p>Standard & Poor’s RM Quality Scale: five categories, three TRM levels ('weak' = lacks reliable loss control systems, 'adequate' = still be managing risks in silos, 'adequate with a positive trend' = still lacks a well-developed process for making coordinated risk/reward decisions) and two ERM levels ('strong' = beyond silo RM to deal with risks in a coordinated approach, well-developed risk-control processes and a focus on optimizing risk-adjusted returns; 'excellent' = even further in implementation) as a proxy for degree of RM implementation (adapted from Standard & Poor's, 2006)</p>	<p>Tobin's Q as the market value of equity plus the book value of liabilities divided by the book value of assets</p>	<p>Descriptive results: positive relationship between ERM rating (even a peak for 'adequate with a positive trend' and 'strong' ERM rating) and firm value; Multivariate results: results indicate a positive relationship between “ERM rating” and firm value as the value increases over the first three categories ('weak', 'adequate' and 'adequate with a positive trend')—the first three categories are indicative of increasing levels of TRM—but no additional increase in firm value as the rating moves beyond TRM into what is considered as ERM ('strong' and 'excellent' ERM rating)</p>
<p>Pooser and David, 2012</p>	<p>Examining the potential for ERM to help firms be insulated from and reduce shock as well as increase firm performance.</p> <p>Data: Standard and Poor’s ERM quality ratings for insurers in the years 2009 and 2010 and NAIC annual statements for property-casualty firms from 1996 through 2010</p>	<p>Standard & Poor’s RM Quality Scale. Standard and Poor’s ERM Ratings dataset and combined with the NAIC property and casualty insurance annual statements to identify insurers that do and do not obtain ERM program ratings.</p>	<p>A modified version of the HHI</p>	<p>The effectiveness of an ERM program reduce or prevent shocks to firm performance</p>

<p>Acharyya, 2009</p>	<p>Testing whether ERM influences insurers' stock market performance and the impact of critical events</p> <p>Data: 16 members and 5 associate members of CRO forum (professional RM group, est. in 2004 to work on key relevant risk issues) including primary insurers and reinsurers with life and non-life businesses from several geographical locations</p>	<p>Standard & Poor's RM Quality</p> <p>Scale: five categories, Excellent, Strong, Adequate with positive trend, Adequate and Weak (Standard & Poor's, 2006)</p>	<p>Stock market performance = Standard deviation of stock prices</p>	<p>Insurers' stock market performance depend much on characteristics of industry events rather than performance of ERM OR insurers' stock market performance is an event driven phenomena without maintaining any direct link with ERM</p>
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3. ERM Index Method				
Quon et al., 2012	To explore the relationship between Enterprise Risk Management and firm performance Data: non-financial companies list (S&P) Toronto Stock Exchange (TSX) Composite Index for 2007 and 2008	Using content analysis of their annual reports, particularly the Management Discussion and Analysis (MD&A) and the Notes to the Financial Statements. Fourteen different types of risks were examined under the general headings of financial, business and operational risks. For each type of risk reported, the level of exposure to risk, the consequences of such risk and the strategies for managing that risk were identified.	1. Companies with different financial market measured by Tobin's Q as the market value of equity plus the book value of liabilities divided by the book value of assets and 2. Accounting Performances as measured by changes in earnings before interest and taxes (EBIT) margins and 3. Operational Performances as measured by changes in sales)	ERM information did not predict or have any appreciable effect on business performance.
Grace et al., 2015	Examination of the impact of ERM on firm value by investigating its effect on firm cost and revenue efficiency while controlling for firm specific factors; focus of analysis directly on the cash flow implications of adopting ERM Data: Tillinghast Towers Perrin ERM survey for 2004 and 2006 for ERM practice identification	Used ERM survey from Tillinghast Towers Perrin survey: Detailed information on a number of ERM initiatives from a survey conducted by Tillinghast Towers Perrin on their world-wide insurance clients; variables to evaluate ERM program: economic capital model (ECM); market value based risk metric; CRO or significant risk management entity; entity responsible for risk management	Cost and revenue efficiency (ROA) using frontier efficiency measures (standard linear programming technique, data envelopment analysis (DEA), to construct the “best practice” frontier for each firm and measure the firm’s performance relative to this frontier; frontier efficiency analysis in R (FEAR) to estimate and bootstrap efficiency) for firm performance measurement; value-added approach to	Significant increases in both cost and revenue efficiency; life insurers benefit from the use of economic capital models and produce significant increases in returns on assets; insurer with entity responsible for firm-wide risk management (such as a CRO) also experiences a higher level of cost efficiency and returns on assets; use of risk committee and a primary reporting relationship to the officials in the C-

		reports to the board, the CFO, the CEO, or a committee; risk management influences executive compensation; risk reflection in decision making process.	identify the important outputs of life and property-liability insurers	Suite of the insurer (either the CEO or the CFO) is significantly related to increases in efficiency and return on assets; insurer's confidence that risk is reflected in business decisions is also significantly related to increases in efficiency and returns on assets
Sekerci (2013)	Examination the value-relevance of ERM on firm value Data: A survey 150 Nordic firms that are listed on the Stockholm, Copenhagen, Oslo and Helsinki stock exchanges with headquarters located within Sweden, Denmark, Norway and Finland, respectively on 2011.	Conduct ERM survey: on 25 components of ERM established on survey	The Tobin's Q variable is measured in two ways: 1) Tobin's Q which is equal to (Market Value of Equity) + Total Liabilities)/Book Value of Total Assets. 2) Industry Adjusted Tobin's Q which is calculated for each firm by subtracting the median TQ value of the industry from the TQ of the firm.	They do not find a statistically significant relationship between ERM and firm value after controlling factors.
Baxter (2013)	Examination the value-relevance of ERM on firm value Data: A 165 firm-year observations of financial services firms (banks and insurance companies) during the period 2006-2008 with coverage in the S&P Ratings Direct database.	S&P Ratings Direct database. ERM quality measure ranging from 1 (low) to 6 (high). The numbers of observations in the resulting six levels are: weak = 1, weak - adequate = 2, adequate = 3, strong - adequate = 4, strong = 5, excellent = 6.	Tobin's Q is measured by the book value of the assets – (book value of equity + the market value of equity)/ book value of assets and ROA is measured by income before extraordinary items divided by total assets	The high-quality ERM programs enhance operating performance and add value to companies, controlling for the characteristics identified in the determinants analysis.

Updated and adapted from original study of Kraus and Lehner (2012)

Appendix B.

Survey of ERM performance (English Version)

Enterprise Risk Management Performance in Thai Listed Company
1. Introduction
<p>Dear Respondent</p> <p>This Questionnaire is part of my research on Enterprise Risk management and Firm Performance in Thai Listed Company especially focused on Enterprise Risk Management Measurement Index. The results of the study will be available subsequently to those who participate in the study. It will form part of my Ph.D. research for University of Edinburgh Business School. University of Edinburgh is one of the oldest universities in the world, founded in 1583 and consistently stood among top 25 in global rankings.</p> <p>The questionnaire should just take short time to complete. May I thank you in advance for your time and effort in completing this questionnaire. All individual responses will be treated confidentially in line with the Ethical standards of the University of Edinburgh. No third party will have access to your individual response.</p> <p>The questionnaire should just take short time to complete. May I thank you in advance for your time and effort in completing this questionnaire. All individual responses will be treated confidentially in line with the Ethical standards of the University of Edinburgh. No third party will have access to your individual response.</p> <p>The Questionnaire has four main parts as follow:</p> <p>Part 1 : Introduction Questions Part 2 : Questionnaire of ERM Performance Index Part 3 : Respondent Background Part 4 : Other Comments and Feedback</p> <p>Thank you in advance for your time and effort in completing this questionnaire.</p> <p>Should you have any questions pertaining to the survey please contact juthamon@tbs.tu.ac.th</p> <p>Thank You for participating Juthamon Sithipolvanichgul, CPA Lecturer of accounting, Thammasat Business School PhD candidate, The University of Edinburgh</p>
2. Part 1 : Introduction Questions
<p>1. Name of your Company</p> <input type="text"/>
<p>2. Does your company has Risk Management System?</p> <p><input type="radio"/> YES</p> <p><input type="radio"/> NO (if no go to part 3)</p>
3. PART 2 : Questionnaire of ERM Performance Index

Enterprise Risk Management Performance in Thai Listed Company

1. What is stated form of Risk Management in your company?

- 1. Enterprise Risk Management
- 2. Strategic Risk Management
- 3. Consolidated Risk Management
- 4. Holistic Risk Management
- 5. Risk Management
- 6. Risk Management in Internal Control and Internal Audit Function
- 7. Other (Please specify)

Please specify

2. Have there been any discussions on risk management that have taken place at board level or top management when making strategic decisions (Strategic planning process)?

- YES
- NO, if no go to question 4

4. PART 2 : Questionnaire of ERM Performance Index (Cont.)

2.1 If there are discussions on risk management that have taken place at board level who get involve (tick as many do apply)

- 1.1. Board of Directors
- 1.2. CEO
- 1.3. Top Management
- 1.4. Management Committee
- 1.5. Risk Management Committee
- 1.6. Audit Committee
- 1.7. Chief Risk Officer
- 1.8. Chief Finance Officer

Other (Please specify)

Enterprise Risk Management Performance in Thai Listed Company

3. How often have any discussions on risk management taken place in board or top management level?

- 1. Annually
- 2. Quarterly
- 3. Bi-Annually
- 4. Timely

Other (Please specify)

4. Does your company aligned identified business risks into its routine corporate and business unit process?

- 1. YES
- 2. NO

5. Does your company concern whether risk oversight/management are aligned with the company's strategy?

- 1. YES
- 2. NO

6. Do you receive benefit from risk management?

- 1. YES
- 2. NO, if no go to question 7

5. PART 2 : Questionnaire of ERM Performance Index (Cont.)

Enterprise Risk Management Performance in Thai Listed Company

6.1 How do you perceive the benefit from risk management? (tick as many do apply)

- 1. Risk Management consider critical to achieve of business goal
- 2. Risk Management identify aligning to Strategic Management
- 3. Risk Management benefits of more easily managing a business
- 4. Risk Management is seen as business opportunity
- 5. Risk Management help managing predictable and unpredictable event
- 6. Risk Management enhance company's general management consensus
- 7. Risk Management enhance company's ability to make better-informed decisions
- 8. Risk Management enhance company's ability to articulate and communicate risk taking to the management board and outside stakeholders
- 9. Risk Management increased company management accountability
- 10. Risk Management promote management efficiency at all levels
- 11. Risk Management use as a tool to evaluate the performance of the President & CEO
- 12. Risk Management can prevent unwelcome surprises

Other (Please specify)

7. Which risk Management evidence or document does your company have ? (tick as many do apply)

	Evidence of Prepared
1. Organization Structure	<input type="checkbox"/>
2. Assign Roles, Authority and Responsibility	<input type="checkbox"/>
3. Staff practical guidelines/Job manual	<input type="checkbox"/>
4. Business Continuity Plan	<input type="checkbox"/>
5. Crisis Management	<input type="checkbox"/>
6. Self Control Assessment by boards	<input type="checkbox"/>
7. Self Control Assessment by all staffs	<input type="checkbox"/>

7.1 Which risk Management evidence or document does your company have prepared and/or reviewed ? (if yes tick all that apply)

	Evidence of Prepared	Evidence of Reviewed
8. Risk Management Policy	<input type="checkbox"/>	<input type="checkbox"/>
9. Risk Management is a part of internal control policy	<input type="checkbox"/>	<input type="checkbox"/>
10. Risk Management Framework or Guidelines	<input type="checkbox"/>	<input type="checkbox"/>
11. Risk Appetite	<input type="checkbox"/>	<input type="checkbox"/>
12. Risk Tolerances	<input type="checkbox"/>	<input type="checkbox"/>
13. Risk Register/ Risk Profile/Risk Portfolio	<input type="checkbox"/>	<input type="checkbox"/>

Enterprise Risk Management Performance in Thai Listed Company

8. Do the following risk management departments or committee exist in your company?

(Tick as many do apply)

- 1. Audit committee
- 2. Management committee
- 3. Risk management committee
- 4. Risk management department
- 5. Internal audit and internal control department
- 6. Accounting and Financial Department
- 7. Other (Please specify)
- 8. No department related to risk management

(Please specify)

9. Which organizational Structure of risk management does your company have?

(Tick as many do apply)

- 1. Under risk management committee directed to Management Committee
- 2. Under risk management committee directed to Board of Director
- 3. Under Audit Committee directed to Board of Director
- 4. Under risk management department direct to risk management committee and direct to Board of Director
- 5. Under risk management department direct to risk management committee and direct to Board of Director but need to report risk related to CEO
- 6. Under risk management department direct to Chief Executive director or management
- 7. Under risk management department direct to Finance and Accounting Department and CEO and risk management committee are independent under Board of Director
- 8. Under internal audit and internal control department direct to audit committee and direct to Board of Director
- 9. Under internal audit and internal control department direct to audit committee and direct to Board of Director but need to report risk related to CEO
- 10. Under Accounting and Financial Department and report to CEO
- 11. Other

(Please specify)

10. Do your company have Risk Management Policy acknowledgement?

- YES
- NO, if no go to question 13

6. PART 2 : Questionnaire of ERM Performance Index (Cont.)

Enterprise Risk Management Performance in Thai Listed Company

10.1 Who is the primary responsible for establishing risk management policy? and Who is accountability for planning, monitoring and reviewing risk management policy?

(Tick as many do apply)

	Responsible by	Prepared by	Monitoring by	Reviewed by
1. Board of Directors	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. CEO	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Top Management	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Management Committee	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. Risk Management Committee	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. Audit Committee	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. Chief Risk Officer	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. Chief Finance Officer	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. Chief Internal Officer	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10. Risk Management Department	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11. Internal Audit Department	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12. Each Departments and business units	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13. Other	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

(Please specify)

11. How often your company review the risk management or ERM policy?

- 1. Annually
- 2. Quarterly
- 3. Bi-Annually
- 4. Timely
- 5. When relevant new legislation, standards, codes of practices change
- 6. No review policy

Other (Please specify)

12. At what level does your companies apply risk management policy?

- 1. Applied Across the enterprise at every level and unit
- 2. Business unit Heads accountable
- 3. Treasury, insurance and operation primarily responsible
- 4. Other

(Please specify)

Enterprise Risk Management Performance in Thai Listed Company

13. How often does the board of director have discusses or receive reporting on risk management?

1. Number of meeting (please identify number below)
2. Annually
3. Quarterly
4. Bi-Annually
5. Timely
6. NO such a meeting

Number of meeting (please identify number below)

14. Are there any policy or meeting arrange to manage ad-hoc decision making of the board level?

1. YES, (if yes go to question 14.1)
2. NO, (if no go to question 15)

7. PART 2 : Questionnaire of ERM Performance Index (Cont.)

14.1 Please give number of meeting of general meeting and ad-hoc decision making of the board level?

Number of General meeting

Number of ad-hoc meeting

Doesn't have information (please mention)

15. Do Risk Management Committee establish seperately from audit committee? If there are. How many members of Risk Management Committee?

1. YES (Please identify members of risk management committee)
2. No (if no go to question 19)

Please identify members of risk management committee

8. PART 2 : Questionnaire of ERM Performance Index (Cont.)

Enterprise Risk Management Performance in Thai Listed Company

16. Risk Management Committee come from which levels and how many?

1. Independent Director
2. Management Director
3. Top management level
4. Manager from business level and unit
5. Expertise from outsider
6. Other (Please specify)
7. Cannot have information

17. Number of Risk Management Committee Meeting Each Year

1. Number (Please identify below)
2. Annually
3. Quarterly
4. Bi-Annually
5. Regularly (timely)
6. No meeting

Number of meeting (Please identify)

18. Which Risk Management Committee direct to?

1. Direct to board of director
2. Direct to Top Management/CEO/ Management committee
3. Other

(Please specify)

19. Which standard of Risk Management applied for your company risk management? (Tick as many do apply)

1. COSO ERM framework
2. ISO 31000
3. Regulatory compliance eg. BASEL II,
4. International standard (not identify)
5. COSO Internal Control Framework
6. Other
7. Cannot Disclosed

(Please specify)

Enterprise Risk Management Performance in Thai Listed Company

20. Who are the primary responsible and involve in overall risk management process, coordinate, and responsible for certain activities of the risk functions in Entity level in your company?

(Tick as many do apply)

	Responsible by	Participate by
1. Entity Level/Across the company	<input type="checkbox"/>	<input type="checkbox"/>
2. Board of Directors	<input type="checkbox"/>	<input type="checkbox"/>
3. CEO	<input type="checkbox"/>	<input type="checkbox"/>
4. Top Management	<input type="checkbox"/>	<input type="checkbox"/>
5. Management Committee	<input type="checkbox"/>	<input type="checkbox"/>
6. Risk Management Committee	<input type="checkbox"/>	<input type="checkbox"/>
7. Audit Committee	<input type="checkbox"/>	<input type="checkbox"/>
8. Chief Risk Officer	<input type="checkbox"/>	<input type="checkbox"/>
9. Chief Finance Officer	<input type="checkbox"/>	<input type="checkbox"/>
10. Chief Internal Officer	<input type="checkbox"/>	<input type="checkbox"/>
11. Risk Management Department	<input type="checkbox"/>	<input type="checkbox"/>
12. Internal Audit Department	<input type="checkbox"/>	<input type="checkbox"/>
13. Each Departments and business units	<input type="checkbox"/>	<input type="checkbox"/>
14. Other	<input type="checkbox"/>	<input type="checkbox"/>

(Please specify)

21. Are there any risk appetite identifies, awareness or risk management from the board level or among top management disclosure in the annual report?

1. YES
2. NO, (if no go to question 22)

9. PART 2 : Questionnaire of ERM Performance Index (Cont.)

21.1 Refer from question 21, If there are which part?

1. Message from the Chairman/board of director/top-management
2. Report of Director
3. Report of the Risk Management Committee
4. The Audit Committee's Report
5. Other Parts

22. Has your company determined Risk Appetite?

1. YES
2. NO, (if no next question is 27)

Enterprise Risk Management Performance in Thai Listed Company

10. PART 2 : Questionnaire of ERM Performance Index (Cont.)

23. Who takes the primary decision and responsible to identify review and monitoring about Risk Appetite? and Who have responsible for planning, monitoring and reviewing risk appetite? (Tick as many do apply)

	Responsible	Prepared	Monitoring	Reviewed
1. Board of Directors	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. CEO	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Top Management	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Management committee	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. Risk Management Committee	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. Audit Committee	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. Chief Risk Officer	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. Chief Finance Officer	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. Chief Internal Audit Officer	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10. Risk Management Department	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11. Internal Audit Department	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12. Each Departments and business units	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13. Other (Please specify).....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

(Please specify)

24. How often do your company review the risk Appetite?

- 1. Number (Please identify below)
- 2. Annually
- 3. Quarterly
- 4. Every 6 months
- 5. Timely
- 6. No meeting

Number (Please identify)

Enterprise Risk Management Performance in Thai Listed Company

25. Are there any process to manage potential events or identified risk ? (Tick as many do apply)

- 1. Top Management brainstorming approach
- 2. Facilitates Workshops in cross-functional Group
- 3. Responsible for risk committee to identified risk
- 4. Defines roles and responsibilities for directly relevant parties
- 5. Top-down Technique
- 6. Bottom-Up Technique eg. Self assessment
- 7. Systematically receives information both internal and changes in the environment
- 8. Other Method
- 9. No identified process

26. Are there any techniques used to evaluate risk mitigation strategies? (Tick as many do apply)

- 1. Risk Map/Risk Matrix
- 2. Quantitative Risk Assessment/Quantitative Risk Assessment
- 3. Cost/benefit analysis
- 4. Value at Risk (VAR)
- 5. Risk adjust Net Present Value (NPV)
- 6. Other Method
- 7. No techniques used

(Please specify)

Enterprise Risk Management Performance in Thai Listed Company

27. Which type of risks that your company separately identified? (Tick as many do apply)

	Identify Risk
Strategic risk	<input type="checkbox"/>
External risk	<input type="checkbox"/>
Natural and Man-made Hazards risk	<input type="checkbox"/>
Economic risk	<input type="checkbox"/>
Political risk	<input type="checkbox"/>
Business/Industry risk	<input type="checkbox"/>
Market risk	<input type="checkbox"/>
Internal Risk	<input type="checkbox"/>
Financial risk	<input type="checkbox"/>
Credit risk	<input type="checkbox"/>
Interest rate risk	<input type="checkbox"/>
Foreign exchange risk	<input type="checkbox"/>
Equity price risk	<input type="checkbox"/>
Liquidity risk	<input type="checkbox"/>
Capital management	<input type="checkbox"/>
Operational risk	<input type="checkbox"/>
Reporting risk	<input type="checkbox"/>
Compliance risk	<input type="checkbox"/>
Reputational Risk	<input type="checkbox"/>
Informational Risk	<input type="checkbox"/>
Sector specified risk	<input type="checkbox"/>
Capital Adequacy Risk	<input type="checkbox"/>
Other	<input type="checkbox"/>

(Please Specify)

Enterprise Risk Management Performance in Thai Listed Company

28. If your company identify reputational risk, How do you manage?

(Tick as many do apply)

- 1. Concerned company credit rating from rating service company eg. S&P
- 2. Having Cooperate Social Responsibility Scheme
- 3. Developing good corporate governance systems and practices
- 4. Having channel to respond customer complaints
- 5. Creating company's Brand image and improve customer satisfaction
- 6. Timely Monitoring stock price and performance volatility
- 7. Concerned improve workplace environment and employee
- 8. Other Method

(Please specify)

29. Is your company has clear documents or standards for risk taking and risk management that are widely understood within the company?

- 1. YES eg. Risk management Policy, framework, guideline and etc.
- 2. NO

30. Are there any clear communication for its expectation for risk taking to senior manager or responsible persons ?

- 1. YES
- 2. NO

Enterprise Risk Management Performance in Thai Listed Company

31. What is the policy or channel of risk communicate throughout the company?

(Tick as many do apply)

- 1. Risk management as a cooperate culture
- 2. Fully communicated and acknowledged policy and procedure
- 3. Policies and procedures in writing
- 4. Clearly stated in the functional job descriptions or job manual of all units
- 5. Everyone need to sign their understand and acknowledge
- 6. Self assessment of employee
- 7. Self assessment of director
- 8. Concern whistleblower system and Complaints
- 9. Having Investor relation center (Stakeholder)
- 10. Disclosed in Company website (Stakeholder)
- 11. Disclosed in Annual report in English (Stakeholder)
- 12. Other Method

(Please specify)

32. Are there any training, coaching or educational programs are being offer to director?

- 1. YES
- 2. YES especially have training program of risk management
- 3. NO

33. Are there any training, coaching or educational programs are being offer to staff?

- 1. YES
- 2. YES especially have training program of risk management
- 3. NO

34. Does information systems in your company provide adequate information to be able to identify, assess and respond to risks and ultimately achieve its objectives?

- 1. YES
- 2. NO

Enterprise Risk Management Performance in Thai Listed Company

35. Which risk management information system or infrastructures use in your company?

(Tick as many do apply)

- 1. Risk Management System
- 2. Enterprise Resource Planning eg. SAP Oracle
- 3. IT Recovery and Back-up Plan or Disaster Recovery Plan
- 4. Business Outlook Projection
- 5. Effective Technology and Information system entirely
- 6. Very limit Technology and Information system mostly in Finance and Accounting dept.
- 7. Any Other Programs

(Please specify)

36. Who has the responsibility to disclose accuracy, validity and timely of information to stakeholder?

(Tick as many do apply)

- 1. Board of Directors
- 2. Audit Committee
- 3. IT Department
- 4. Internal audit and internal control department
- 5. Every responsible Departments and business units
- 6. Other

(Please specify)

37. Is your company assigned the primary responsible person to monitor overall risk management on timely basis ?

- 1. YES
- 2. NO

Enterprise Risk Management Performance in Thai Listed Company

38. Which technique or method that your company use to monitor risk management?

(Tick as many do apply)

- 1. Early Warning Indications establish for operation
- 2. Enterprise Performance Appraisal
- 3. Benchmarking against policy or the best practice
- 4. Balanced scorecards and Key Performance Indicators (KPI)
- 5. Standards operational performance and financial ratio
- 6. Timely Reporting System method to Management
- 7. Other

(Please specify)

11. PART 3 : Respondent Background

1. Age

- 1. Less than 35 year old
- 2. from 35 to 45 year old
- 3. from 46 to 55 year old
- 4. More than 55 year old

2. Education

- 1. Bachelor's degree
- 2. Master's degree or higher degree

3. Year of working in the company

- 1. Less than 5 year
- 2. From 5 year to 10 year
- 3. From 10 year to 15 year
- 4. From 15 year to 20 year
- 5. More than 20 year

Enterprise Risk Management Performance in Thai Listed Company

4. What is your position in the company?

- 1. Top Management
- 2. Risk Management Committee or Audit Committee
- 3. Chief Risk Officer
- 4. Chief Finance Officer
- 5. Manager
- 6. Senior Officer
- 7. Other

(Please specify)

5. Can I contact you in the future concerning this research or interest to participate in analyzing risk management in your company?

Name :

Department :

Tel :

12. PART 4 : Comments and Feedback

1. Other comments (If any)

2. If you would like to get feedback on ERM performance of average Thai listed company, please give us your contact (we will send feedback afterward)

Name :

Email :

Survey of ERM performance (Thai Version)



แบบสอบถาม

เรื่อง “การบริหารความเสี่ยงทั่วทั้งองค์กรต่อผลประกอบการของบริษัทจดทะเบียนในตลาดหลักทรัพย์แห่งประเทศไทย (Enterprise Risk Management and Firm Performance in Thai Listed Company)”

เรียนผู้ตอบแบบสอบถาม

ด้วยข้าพเจ้า อาจารย์ภาควิชาการบัญชี คณะพาณิชยศาสตร์และการบัญชี มหาวิทยาลัยธรรมศาสตร์ มีความประสงค์ที่จะทำการวิจัยเกี่ยวกับ “การบริหารความเสี่ยงทั่วทั้งองค์กรต่อผลประกอบการของบริษัทจดทะเบียนในตลาดหลักทรัพย์แห่งประเทศไทย” ซึ่งโครงการวิจัยนี้เป็นส่วนหนึ่งของหลักสูตรปริญญาเอก สาขาวิชา PhD Management ณ University of Edinburgh ณ ประเทศสหราชอาณาจักร ซึ่งเป็นมหาวิทยาลัยที่ติดอันดับ 1 ใน 25 ของโลก คณะผู้จัดทำจะไม่เปิดเผยชื่อบริษัทของท่านในรายงานวิจัยและจะทำการประมวลผลในภาพรวมเท่านั้น คณะผู้จัดทำโครงการวิจัยใคร่ขอขอบคุณที่ท่านได้กรุณาสละเวลาอันมีค่าในการช่วยตอบแบบสอบถามฉบับนี้ หรือกรุณามอบหมายให้ผู้ที่ทำหน้าที่รับผิดชอบ

คำชี้แจง

แบบสอบถามนี้สร้างขึ้นเพื่อศึกษาผลการบริหารความเสี่ยงทั่วทั้งองค์กรของบริษัทจดทะเบียนในตลาดหลักทรัพย์แห่งประเทศไทย เพื่อขอข้อมูลในปี 2555 คำตอบของท่านจะเป็นประโยชน์อย่างยิ่งในการนำมาประมวลผลเพื่อหาข้อสรุปภาพรวมของการใช้การบริหารความเสี่ยงทั่วทั้งองค์กร ซึ่งจะสามารถนำมาปรับปรุงพัฒนาการบริหารความเสี่ยงให้ดียิ่งขึ้น

1. แบบสอบถามฉบับนี้มีทั้งหมด 4 ส่วน คือ

- ส่วนที่ 1 ข้อมูลทั่วไป
- ส่วนที่ 2 ข้อมูลเกี่ยวกับการบริหารความเสี่ยงทั่วทั้งองค์กร
- ส่วนที่ 3 ข้อมูลเกี่ยวกับผู้ตอบแบบสอบถาม
- ส่วนที่ 4 ข้อเสนอแนะและตอบรับข้อมูลวิจัย

2. คำตอบของท่านจะเป็นประโยชน์อย่างยิ่งและถูกเก็บรักษาเป็นความลับ ไม่ส่งผลกระทบต่อตัวท่าน

3. ท่านสามารถขอรับผลการวิจัยนี้ในภาพรวมของบริษัทจดทะเบียนในตลาดหลักทรัพย์แห่งประเทศไทยได้โดยให้ email ของท่าน ในส่วนที่ 4 ของแบบสอบถาม เพื่อสามารถนำไปวางแผนและพัฒนาการบริหารความเสี่ยงในบริษัทฯ ของท่านต่อไป

ขอขอบคุณในความร่วมมือ

อาจารย์จuthamon สิทธิผลวนิชกุล, CPA

ภาควิชาการบัญชี คณะพาณิชยศาสตร์และการบัญชี

มหาวิทยาลัยธรรมศาสตร์

หมายเหตุ : โปรดตอบแบบสอบถามและส่งคืนภายในวันที่ 15 พฤษภาคม 2556 โดยอีเมลล์มาที่ juthamon@tbs.tu.ac.th หรือแฟกซ์ 029030080 ต่อ 2594 หรือ ใช้ช่องที่แนบมาพร้อมนี้

โปรดทำเครื่องหมาย x หรือเติมคำในช่องว่างที่ตรงกับบริษัทฯ ของท่านมากที่สุด ซึ่งเป็นข้อมูลในปีที่ผ่านมา (พ.ศ. 2555)

ส่วนที่ 1 ข้อมูลทั่วไป

ข้อ 1. ชื่อบริษัทฯ.....

ข้อ 2. บริษัทฯ ของท่านใช้ระบบบริหารความเสี่ยง(Risk Management) ในองค์กรหรือไม่

1. ใช่
 2. ไม่ใช่ (ถ้าไม่ใช่ ให้ข้ามไปตอบใน ส่วนที่ 3)

ส่วนที่ 2 ข้อมูลเกี่ยวกับการบริหารความเสี่ยงทั่วทั้งองค์กร

ข้อ 1. บริษัทฯ ของท่านเรียกการบริหารความเสี่ยงว่าอย่างไร

1. การบริหารความเสี่ยงทั่วทั้งองค์กร (Enterprise Risk Management)
 2. การบริหารความเสี่ยงเชิงกลยุทธ์ (Strategic Risk Management)
 3. การบริหารความเสี่ยงองค์กรรวม (Consolidated Risk Management)
 4. การบริหารความเสี่ยงเชิงบูรณาการ (Holistic Risk Management)
 5. การบริหารความเสี่ยง (Risk Management)
 6. การบริหารความเสี่ยงเป็นส่วนหนึ่งของการควบคุมภายใน (Risk Management in internal control)
 7. อื่นๆ(โปรดระบุ).....

Risk Governance and Culture

ข้อ 2. เมื่อมีการวางแผนกลยุทธ์ในองค์กร บริษัทฯ ของท่านได้นำปัญหา เกี่ยวกับความเสี่ยงต่างๆ เพื่อร่วมในการพิจารณากลยุทธ์หรือไม่

1. มีการพิจารณา - ในระดับใดบ้าง (สามารถเลือกได้หลายข้อตามที่บริษัทฯ ของท่านมี)
- 1.1. คณะกรรมการบริษัท (Board of Directors)
 - 1.2. ประธานกรรมการบริหาร (CEO)
 - 1.3. ผู้บริหารระดับสูง (Top Management)
 - 1.4. คณะกรรมการบริหาร (Management Committee)
 - 1.5. คณะกรรมการบริหารความเสี่ยง (Risk Management Committee)
 - 1.6. คณะกรรมการตรวจสอบ (Audit Committee)
 - 1.7. ผู้อำนวยการฝ่ายบริหารความเสี่ยง (Chief Risk Officer)
 - 1.8. ผู้อำนวยการฝ่ายการบัญชีและการเงิน (Chief Finance Officer)

2. ไม่มีการพิจารณา (ถ้าไม่มีให้ข้ามไปที่คำถามที่ 4)

ข้อ 3. จำนวนครั้งในการประชุมวางแผนกลยุทธ์ต่อปี

1. ปีละครั้ง
 2. ทุกไตรมาส
 3. ทุกครึ่งปี
 4. เป็นประจำ

ข้อ 4. บริษัทฯ ของท่านมีการระบุความเสี่ยงในระดับกระบวนการการทำงานหรือไม่

1. มี
 2. ไม่มี

ข้อ 5. การจัดทำนโยบายการบริหารความเสี่ยงของบริษัทฯ ท่านได้คำนึงถึงความสอดคล้องกับกลยุทธ์ขององค์กรหรือไม่

1. มี
2. ไม่มี

ข้อ 6. การบริหารความเสี่ยง (Risk Management) มีความสำคัญต่อการดำเนินงานในบริษัทฯ ของท่านหรือไม่

1. สำคัญ - ถ้ามี มีประโยชน์อย่างไร (สามารถเลือกได้มากกว่า 1 ข้อ)
- 1.1. มีความสำคัญในการบรรลุเป้าหมายขององค์กร
 - 1.2. มีความสำคัญต่อการบริหารกลยุทธ์
 - 1.3. ช่วยในการบริหารองค์กรได้ง่ายขึ้น
 - 1.4. ช่วยทำให้เกิดโอกาสทางธุรกิจใหม่
 - 1.5. ช่วยวางแผนป้องกันการเหตุการณ์ที่อาจเกิดขึ้น
 - 1.6. ช่วยทำให้การประชุมผู้บริหารดำเนินไปในทิศทางเดียวกัน
 - 1.7. ช่วยทำให้ผู้บริหารสามารถตัดสินใจได้ดีขึ้น
 - 1.8. ช่วยให้สามารถสื่อสารปัจจัยความเสี่ยงกับทั้งฝ่ายบริหารและผู้มีส่วนได้ส่วนเสียต่อกิจการ
 - 1.9. ช่วยให้ผู้บริหารทราบหน้าที่ความรับผิดชอบ
 - 1.10. การบริหารความเสี่ยงช่วยการบริหารทุกระดับในองค์กร
 - 1.11. ให้อะไรในการประเมินผลงานของผู้บริหารระดับสูง
 - 1.12. ช่วยป้องกันการเหตุการณ์ที่อาจเกิดขึ้น
2. ไม่มีสำคัญ

EVIDENCE เอกสารต่างๆ ที่บริษัทจัดทำขึ้น

ข้อ 7. เอกสารหรือหลักฐานต่างๆ ที่บริษัทฯ ของท่านได้จัดทำขึ้น(Prepared) และมีการสอบทาน (Review) เอกสารดังกล่าวหรือไม่ (เลือกแต่ละหัวข้อตามที่บริษัทฯ ของท่านมี)

เอกสาร/หลักฐาน	มีการจัดทำขึ้น	
1. โครงสร้างองค์กร (Organization Structure)	<input type="checkbox"/>	<input type="checkbox"/>
2. การกำหนดหน้าที่ ความรับผิดชอบ (Assign Roles, Authority and Responsibility)	<input type="checkbox"/>	<input type="checkbox"/>
3. คู่มือการปฏิบัติงาน/ ตัวอย่างการปฏิบัติงาน (Staff practical guidelines/Job manual)	<input type="checkbox"/>	<input type="checkbox"/>
4. แผนการวางธุรกิจต่อเนื่อง (Business Continuity Plan)	<input type="checkbox"/>	<input type="checkbox"/>
5. แนวทางในการจัดการในภาวะวิกฤติ (Crisis Management)	<input type="checkbox"/>	<input type="checkbox"/>
6. การประเมินตนเองเพื่อควบคุมความเสี่ยงจากผู้บริหาร (Self Control Assessment by boards)	<input type="checkbox"/>	<input type="checkbox"/>
7. การประเมินตนเองเพื่อควบคุมความเสี่ยงจากพนักงาน (Self Control Assessment by all staffs)	<input type="checkbox"/>	<input type="checkbox"/>
เอกสาร/หลักฐาน	มีการจัดทำขึ้น	มีการสอบทาน
8. นโยบายการบริหารความเสี่ยง (Risk Management Policy)	<input type="checkbox"/>	<input type="checkbox"/>
9. นโยบายการบริหารความเสี่ยงภายใต้นโยบายการควบคุมภายใน (Under internal control policy)	<input type="checkbox"/>	<input type="checkbox"/>
10. โครงสร้างและแนวทางการบริหารความเสี่ยง (Risk Management Framework or Guidelines)	<input type="checkbox"/>	<input type="checkbox"/>
11. ระดับความเสี่ยงที่ยอมรับได้ (Risk Appetite)	<input type="checkbox"/>	<input type="checkbox"/>
12. ค่าเบี่ยงเบนความเสี่ยงที่ยอมรับได้ (Risk Tolerances)	<input type="checkbox"/>	<input type="checkbox"/>
13. ทะเบียนความเสี่ยง (Risk Register/ Risk Profile/Risk Portfolio)	<input type="checkbox"/>	<input type="checkbox"/>

โครงสร้างหน่วยงานการบริหารความเสี่ยง (Risk Management Structure and Architecture)

ข้อ 8. บริษัทฯ ของท่าน ได้มีหน่วยงานหรือคณะกรรมการฯ ใดบ้างที่เกี่ยวข้องกับการบริหารความเสี่ยงในองค์กร

(สามารถเลือกได้หลายข้อตามที่บริษัทฯ ของท่านมี)

- 1. คณะกรรมการการตรวจสอบ (Audit committee)
- 2. คณะกรรมการบริหาร (Management committee)
- 3. คณะกรรมการบริหารความเสี่ยง (Risk management committee)
- 4. หน่วยงานการบริหารความเสี่ยง (Risk management department)
- 5. หน่วยงานตรวจสอบและการควบคุมภายใน (Internal audit and internal control department)
- 6. ฝ่ายบัญชีและการเงิน (Accounting and Financial Department)
- 7. อื่นๆ(โปรดระบุ).....
- 8. ไม่มีหน่วยงานที่เกี่ยวข้องกับการบริหารความเสี่ยง

ข้อ 9. บริษัทฯ ของท่านมีโครงสร้างหน่วยงานที่รับผิดชอบด้านการบริหารความเสี่ยงอย่างไร (สามารถเลือกได้มากกว่า 1 ข้อ)

- 1. ภายใต้คณะกรรมการบริหารความเสี่ยง ขึ้นตรงต่อคณะกรรมการบริหาร
- 2. ภายใต้คณะกรรมการบริหารความเสี่ยง ขึ้นตรงต่อคณะกรรมการบริษัท
- 3. ภายใต้คณะกรรมการการตรวจสอบ ขึ้นตรงต่อคณะกรรมการบริษัท
- 4. มี หน่วยงานการบริหารความเสี่ยง ขึ้นตรงต่อคณะกรรมการบริหารความเสี่ยงและขึ้นตรงต่อคณะกรรมการบริษัท
- 5. มี หน่วยงานการบริหารความเสี่ยง ขึ้นตรงต่อคณะกรรมการบริหารความเสี่ยงและขึ้นตรงต่อคณะกรรมการบริษัท และต้องรายงานความเสี่ยงต่างๆ ให้ประธานฝ่ายบริหารทราบ
- 6. มี หน่วยงานการบริหารความเสี่ยง ขึ้นตรงต่อประธานฝ่ายบริหารและคณะกรรมการบริหาร
- 7. มี หน่วยงานการบริหารความเสี่ยง ขึ้นตรงต่อฝ่ายบัญชีและการเงินและประธานฝ่ายบริหารและคณะกรรมการบริหาร ในขณะที่หน่วยงานการบริหารความเสี่ยง เป็นอิสระขึ้นตรงต่อคณะกรรมการบริษัท
- 8. มี หน่วยงานตรวจสอบและควบคุมภายใน ขึ้นตรงต่อคณะกรรมการบริหารความเสี่ยงและขึ้นตรงต่อคณะกรรมการบริษัท
- 9. มี หน่วยงานตรวจสอบและควบคุมภายใน ขึ้นตรงต่อคณะกรรมการบริหารความเสี่ยงและขึ้นตรงต่อคณะกรรมการบริษัท และต้องรายงานความเสี่ยงต่างๆ ให้ประธานฝ่ายบริหารทราบ
- 10. ภายใต้ แผนกบัญชีและการเงิน ขึ้นตรงต่อฝ่ายบริหาร หรือ CEO
- 11. อื่นๆ(โปรดระบุ).....

นโยบายการบริหารความเสี่ยง (Risk Management Policy)

(สำหรับบริษัทฯ ของท่านไม่มี ให้ข้ามไปตอบข้อ 13)

ข้อ 10. ใครที่มีหน้าที่ ความรับผิดชอบ ในการกำหนดนโยบายการบริหารความเสี่ยง (Risk management policy) และ ใครเป็นผู้รับผิดชอบในการจัดทำ (Prepared) ติดตาม (Monitoring) และ สอบทาน (Reviewed) นโยบายดังกล่าว (แบ่งเป็น 2 คำถาม โปรดเลือก ได้หลายบุคคลหรือหน่วยงานที่เกี่ยวข้อง)

บุคคลที่เกี่ยวข้อง	ผู้รับผิดชอบ (Responsible)	จัดทำ (Prepared)	ติดตาม (Monitoring)	สอบทาน (Reviewed)
1. คณะกรรมการบริษัท (Board of Directors)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. ประธานกรรมการบริหาร (CEO)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. ผู้บริหารระดับสูง (Top Management)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. คณะกรรมการบริหาร (Management Committee)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. คณะกรรมการบริหารความเสี่ยง (Risk Management Committee)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. คณะกรรมการตรวจสอบ (Audit Committee)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. ผู้อำนวยการฝ่ายบริหารความเสี่ยง (Chief Risk Officer)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. ผู้อำนวยการฝ่ายการบัญชีและการเงิน (Chief Finance Officer)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. ผู้อำนวยการฝ่ายตรวจสอบและควบคุมภายใน (Chief Internal Officer)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10. หน่วยงานด้านการบริหารความเสี่ยง (Risk Management Department)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11. หน่วยงานตรวจสอบและการควบคุมภายใน (Internal Audit Department)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12. ทุกแผนกและหน่วยงาน (Each Departments and business units)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13. อื่นๆ(โปรดระบุ).....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

ข้อ 11. จำนวนครั้งที่บริษัทสอบทานนโยบายการบริหารความเสี่ยง (Risk management policy)

- 1. ทุกปี
- 2. ทุกไตรมาส
- 3. ทุกครึ่งปี
- 4. เป็นประจำ
- 5. เมื่อมีการเปลี่ยนแปลงมาตรฐานการบริหารความเสี่ยง หรือกฎระเบียบต่างๆ ที่เกี่ยวข้อง

ข้อ 12. บริษัทฯ ของท่านได้นำนโยบายการบริหารความเสี่ยงไปใช้กับหน่วยงานใดบ้าง

- 1. ใช้ทั้งองค์กรกับทุกหน่วยงานและทุกระดับ (Applied Across the enterprise at every level and unit)
- 2. ใช้ในระดับหน่วยงาน (Business unit Heads accountable)
- 3. ใช้กับแผนกบัญชีและการเงินรวมถึงแผนกที่เกี่ยวข้องกับการดำเนินงาน (Treasury, insurance and operation primarily responsible)
- 4. อื่นๆ(โปรดระบุ).....

คณะกรรมการบริษัทและผู้บริหารระดับสูง (Board Level and Top Management)

ข้อ 13. จำนวนครั้งในแต่ละปีที่คณะกรรมการบริษัทฯ ได้กำหนดให้มีการประชุมหรือหรือเกี่ยวกับการบริหารความเสี่ยงหรือได้รับรายงานด้านการบริหารความเสี่ยงในองค์กร

..... 1.จำนวนครั้งต่อปี (โปรดระบุ)

- 2. ปีละครั้ง
- 3. ทุกไตรมาส
- 4. ทุกครึ่งปี
- 5. เป็นประจำ
- 6. ไม่มีการประชุมดังกล่าว

ข้อ 14. มีการกำหนดนโยบายให้มีการประชุมสำหรับคณะกรรมการบริษัทฯ (Board of Directors) สำหรับเรื่องเร่งด่วนนอกเหนือจากการประชุมปกติหรือไม่

1.มี (โปรดใส่จำนวนครั้งในการประชุม)

.....จำนวนการประชุมปกติ

.....จำนวนการประชุมพิเศษ (ใส่ -ไม่มี- ถ้ามีนโยบายดังกล่าวแต่ไม่มีการประชุมพิเศษในระหว่างปี)

2. ไม่มี

คณะกรรมการบริหารความเสี่ยง (Risk Management Committee)

(ถ้าบริษัทฯ ของท่านไม่มีคณะกรรมการบริหารความเสี่ยง ให้ข้ามไปตอบข้อ 19)

ข้อ 15. โปรดระบุจำนวนสมาชิกในคณะกรรมการบริหารความเสี่ยงในบริษัทฯ ของท่าน (Member of Risk Management Committee)

..... จำนวนสมาชิกคณะกรรมการบริหารความเสี่ยง

ข้อ 16. คณะกรรมการบริหารความเสี่ยงประกอบด้วยสมาชิกจากระดับใดบ้าง และมีจำนวนกี่คน

	จำนวนคน
<input type="checkbox"/> 1. คณะกรรมการอิสระ
<input type="checkbox"/> 2. คณะกรรมการบริหาร
<input type="checkbox"/> 3. ผู้บริหารระดับสูง
<input type="checkbox"/> 4. ระดับผู้จัดการ
<input type="checkbox"/> 5. ผู้เชี่ยวชาญจากภายนอก
<input type="checkbox"/> 6. อื่นๆ(โปรดระบุ)

ข้อ 17. จำนวนครั้งในการประชุมคณะกรรมการบริหารความเสี่ยง

..... 1.จำนวนครั้งต่อปี (โปรดระบุ)

- 2. ปีละครั้ง
- 3. ทุกไตรมาส
- 4. ทุกครึ่งปี
- 5. เป็นประจำ
- 6. ไม่มีการประชุมดังกล่าว

ข้อ 18. คณะกรรมการบริหารความเสี่ยง (Risk Management Committee) มีโครงสร้างขึ้นตรงกับใครหรือหน่วยงานใด

- 1. ขึ้นตรงต่อคณะกรรมการบริษัท
- 2. ขึ้นตรงต่อผู้บริหารระดับสูง/ประธานบริหาร/ คณะกรรมการบริหาร
- 3. อื่นๆ(โปรดระบุ).....

มาตรฐานฯ ในการบริหารความเสี่ยงของบริษัทฯ

ข้อ 19. บริษัทฯ ของท่านใช้มาตรฐานใดเป็นหลักในการบริหารความเสี่ยงของบริษัทฯ (สามารถเลือกได้หลายข้อ)

- 1. แนวทางการบริหารความเสี่ยงทั่วทั้งองค์กรตามแนวคิดของ COSO ERM (COSO ERM framework)
- 2. ISO 31000
- 3. กฎหมายหรือข้อบังคับที่กำหนด Regulatory compliance e.g. BASEL II.
- 4. มาตรฐานการบริหารความเสี่ยงสากล (ไม่ระบุ)
- 5. การควบคุมภายในตามแนวคิดของ COSO (COSO Internal Control Framework)
- 6. อื่นๆ(โปรดระบุ).....
- 7. ไม่ระบุ

กระบวนการการบริหารความเสี่ยง (PROCESS)

ข้อ 20. ใครที่มีหน้าที่ความรับผิดชอบในกระบวนการการบริหารความเสี่ยงเพื่อให้มั่นใจว่ามีการบริหารความเสี่ยงทั่วทั้งองค์กรอย่างมีประสิทธิภาพ และใครมีส่วนร่วมในกระบวนการดังกล่าวบ้าง (แบ่งเป็น 2 ภาคว่า โปรดเลือกได้หลายบุคคลหรือหน่วยงานที่มีส่วนเกี่ยวข้อง)

บุคคลที่เกี่ยวข้อง	ผู้รับผิดชอบ (Responsible by)	บุคคลที่มีส่วนร่วม (Participate by)
1. ทั่วทั้งองค์กร (Entity Level/Across the company)	<input type="checkbox"/>	<input type="checkbox"/>
2. คณะกรรมการบริษัท (Board of Directors)	<input type="checkbox"/>	<input type="checkbox"/>
3. ประธานกรรมการบริหาร (CEO)	<input type="checkbox"/>	<input type="checkbox"/>
4. ผู้บริหารระดับสูง (Top Management)	<input type="checkbox"/>	<input type="checkbox"/>
5. คณะกรรมการบริหาร (Management Committee)	<input type="checkbox"/>	<input type="checkbox"/>
6. คณะกรรมการบริหารความเสี่ยง (Risk Management Committee)	<input type="checkbox"/>	<input type="checkbox"/>
7. คณะกรรมการการตรวจสอบ (Audit Committee)	<input type="checkbox"/>	<input type="checkbox"/>
8. ผู้อำนวยการฝ่ายบริหารความเสี่ยง (Chief Risk Officer)	<input type="checkbox"/>	<input type="checkbox"/>
9. ผู้อำนวยการฝ่ายการบัญชีและการเงิน (Chief Finance Officer)	<input type="checkbox"/>	<input type="checkbox"/>
10. ผู้อำนวยการฝ่ายตรวจสอบและควบคุมภายใน (Chief Internal Officer)	<input type="checkbox"/>	<input type="checkbox"/>
11. หน่วยงานด้านการบริหารความเสี่ยง (Risk Management Department)	<input type="checkbox"/>	<input type="checkbox"/>
12. หน่วยงานตรวจสอบและการควบคุมภายใน (Internal Audit Department)	<input type="checkbox"/>	<input type="checkbox"/>
13. ทุกแผนกและหน่วยงาน (Each Departments and business units)	<input type="checkbox"/>	<input type="checkbox"/>
14. อื่นๆ(โปรดระบุ).....	<input type="checkbox"/>	<input type="checkbox"/>

การกำหนดระดับความเสี่ยงที่องค์กรยอมรับได้ (Risk Appetite)

ข้อ 21. บริษัทฯ ของท่านมีการเปิดเผยข้อมูล เช่น รายงานประจำปีของบริษัทฯ มีการระบุถึงความเสี่ยง หรือการบริหารความเสี่ยง จากคณะกรรมการบริษัทหรือผู้บริหารระดับสูงหรือไม่

1. มี (โปรดระบุ อยู่ในรายงานส่วนใด)
- 1.1 สารบัญจากประธานบริษัท/คณะกรรมการบริหาร/ผู้บริหารระดับสูง
 - 1.2 รายงานหน้าที่และความรับผิดชอบของคณะกรรมการ
 - 1.3 รายงานคณะกรรมการบริหารความเสี่ยง
 - 1.4 รายงานคณะกรรมการตรวจสอบ
 - 1.5 อื่นๆ(โปรดระบุ).....
2. ไม่มี

ข้อ 22. บริษัทฯ ของท่านมีการกำหนดระดับความเสี่ยงที่ยอมรับได้หรือไม่ (Identify Risk Appetite)

1. มี
2. ไม่มี (ถ้าไม่มีให้ข้ามไปข้อ 27)

ข้อ 23. ใครที่มีความรับผิดชอบในการกำหนด ระดับความเสี่ยงที่ยอมรับได้ (Risk Appetite) ในองค์กร และใครเป็นผู้รับผิดชอบในการจัดทำ (Prepared) ติดตาม (Monitoring) และ สอบทาน (Reviewed) ระดับความเสี่ยงที่ยอมรับได้ (Risk Appetite) (แบ่งเป็น 2 คำถาม โปรดเลือกได้หลายบุคคลหรือหน่วยงานที่มีส่วนเกี่ยวข้อง)

บุคคลที่เกี่ยวข้อง	ผู้รับผิดชอบ (Responsible)	จัดทำ (Prepared)	ติดตาม (Monitoring)	สอบทาน (Reviewed)
1. คณะกรรมการบริษัท (Board of Directors)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. ประธานกรรมการบริหาร (CEO)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. ผู้บริหารระดับสูง (Top Management)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. คณะกรรมการบริหาร (Management Committee)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. คณะกรรมการบริหารความเสี่ยง (Risk Management Committee)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. คณะกรรมการตรวจสอบ (Audit Committee)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. ผู้อำนวยการฝ่ายบริหารความเสี่ยง (Chief Risk Officer)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. ผู้อำนวยการฝ่ายการบัญชีและการเงิน (Chief Finance Officer)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. ผู้อำนวยการฝ่ายตรวจสอบและควบคุมภายใน (Chief Internal Audit Officer)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10. หน่วยงานด้านการบริหารความเสี่ยง (Risk Management Department)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11. หน่วยงานตรวจสอบและการควบคุมภายใน (Internal Audit Department)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12. ทุกแผนกและหน่วยงาน (Each Departments and business units)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13. อื่นๆ(โปรดระบุ).....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

ข้อ 24. จำนวนครั้งในการสอบทาน และติดตาม ระดับความเสี่ยงที่ยอมรับได้ (Risk Appetite)

..... 1.จำนวนครั้งต่อปี (โปรดระบุ)

- 2. ปีละครั้ง
- 3. ทุกไตรมาส
- 4. ทุกครึ่งปี
- 5. เป็นประจำ
- 6. ไม่มีการประชุมดังกล่าว

ข้อ 25. กระบวนการใดที่ใช้ในการระบุความเสี่ยงที่สำคัญในองค์กร (สามารถเลือกได้หลายข้อ)

- 1. การระดมความคิดของผู้บริหารระดับสูง (Top Management brainstorming approach)
- 2. การกำหนดการประชุมเชิงปฏิบัติการในหน่วยงานต่างๆ (Workshops in cross-functional Group)
- 3. ให้คณะกรรมการที่รับผิดชอบระบุความเสี่ยงต่างๆ (Responsible committee to identified risk)
- 4. มีการกำหนดหน้าที่และความรับผิดชอบให้บุคคลที่เกี่ยวข้อง (responsibilities for directly relevant parties)
- 5. ความเห็นจากผู้บังคับบัญชาไปยังผู้บังคับบัญชา (Top-down Technique)
- 6. ความเห็นจากผู้บังคับบัญชามาจากผู้บังคับบัญชา (Bottom-Up Technique e.g. Self assessment)
- 7. มีการรับข้อมูลอย่างเป็นระบบจากทั้งภายในและภายนอกบริษัท
- 8. อื่นๆ(โปรดระบุ).....
- 9. ไม่มีกระบวนการดังกล่าว

ข้อ 26. บริษัทฯ ของท่าน ใช้วิธีหรือเทคนิคใดในการบริหารความเสี่ยง (สามารถเลือกได้หลายข้อ)

- 1. ใช้ตารางการวิเคราะห์ความเสี่ยง (Risk Map/Risk Matrix)
- 2. ใช้วิเคราะห์ความเสี่ยงเชิงปริมาณและเชิงคุณภาพ (Quantitative and Qualitative Risk Assessment)
- 3. ใช้วิธีการวิเคราะห์ต้นทุน-ผลประโยชน์ (Cost/benefit analysis)
- 4. ใช้เทคนิค Value-at-Risk (VaR)
- 5. ใช้เทคนิค Risk adjust Net Present Value (NPV)
- 6. อื่นๆ(โปรดระบุ).....
- 7. ไม่มีกระบวนการดังกล่าว

การควบคุมภายในและการระบุความเสี่ยง (Identify Internal Control and Risk)

ข้อ 27. ความเสี่ยงใดบ้างที่บริษัทฯ ของท่าน ได้มีการระบุและจัดการกับความเสี่ยงที่เกิดขึ้น

(สามารถเลือกได้หลายข้อตามที่บริษัทฯ ของท่านระบุ)

ประเภทความเสี่ยง	ความเสี่ยงที่ระบุ
ความเสี่ยงด้านกลยุทธ์ (Strategic risk)	<input type="checkbox"/>
ความเสี่ยงภายนอกองค์กร (External risk)	<input type="checkbox"/>
ความเสี่ยงจากภัยทั้งทางธรรมชาติและจากมนุษย์ (Natural and Man-made Hazards risk)	<input type="checkbox"/>
ความเสี่ยงทางเศรษฐกิจ (Economic risk)	<input type="checkbox"/>
ความเสี่ยงทางการเมือง (Political risk)	<input type="checkbox"/>
ความเสี่ยงทางธุรกิจ/อุตสาหกรรม (Business/Industry risk)	<input type="checkbox"/>
ความเสี่ยงทางการตลาด (Market risk)	<input type="checkbox"/>

ประเภทความเสี่ยง (ค่า)	ความเสี่ยงที่ได้รับ
ความเสี่ยงภายในองค์กร (Internal Risk):	<input type="checkbox"/>
ความเสี่ยงทางการเงิน (Financial risk)	<input type="checkbox"/>
ความเสี่ยงด้านเครดิต (Credit risk)	<input type="checkbox"/>
ความเสี่ยงด้านอัตราดอกเบี้ย (Interest rate risk)	<input type="checkbox"/>
ความเสี่ยงจากอัตราแลกเปลี่ยน (Foreign exchange risk)	<input type="checkbox"/>
ความเสี่ยงด้านราคาตราสารทุน (Equity price risk)	<input type="checkbox"/>
ความเสี่ยงจากสภาพคล่อง (Liquidity risk)	<input type="checkbox"/>
ความเสี่ยงในการบริหารทุน (Capital management)	<input type="checkbox"/>
ความเสี่ยงทางการดำเนินงาน (Operational risk)	<input type="checkbox"/>
ความเสี่ยงด้านรายงาน (Reporting risk)	<input type="checkbox"/>
ความเสี่ยงด้านการปฏิบัติตามกฎระเบียบ (Compliance risk)	<input type="checkbox"/>
ความเสี่ยงด้านชื่อเสียงของบริษัท (Reputational Risk)	<input type="checkbox"/>
ความเสี่ยงด้านสารสนเทศ (Informational Risk)	<input type="checkbox"/>
ความเสี่ยงเฉพาะภาคอุตสาหกรรม	
ความเสี่ยงต่ออัตราเงินกองทุน (Capital Adequacy Risk)	<input type="checkbox"/>
อื่นๆ (โปรดระบุ)	<input type="checkbox"/>
อื่นๆ (โปรดระบุ)	<input type="checkbox"/>

ข้อ 28. ถ้าบริษัทฯ ของท่าน ได้ระบุความเสี่ยงด้านชื่อเสียง ท่านมีวิธีการจัดการกับความเสี่ยงดังกล่าวอย่างไร
(สามารถเลือกได้หลายข้อ)

- 1. ให้ความสำคัญถึงการจัดอันดับเครดิตจากบุคคลภายนอก เช่น S&P credit rating
- 2. ให้ความสำคัญถึงบรรษัทภิบาล (CSR)
- 3. มีการพัฒนาระบบธรรมาภิบาล (Corporate Governance) ให้มีประสิทธิภาพ
- 4. มีช่องทางรับเรื่องร้องเรียนจากลูกค้า
- 5. มีการปรับปรุงภาพลักษณ์ขององค์กรและสินค้าอย่างต่อเนื่อง
- 6. มีการติดตามราคาตลาดของบริษัทและผลประกอบการอยู่เสมอ
- 7. ให้ความสำคัญถึงพนักงาน รวมถึงสภาพแวดล้อมภายในองค์กร
- 8. อื่นๆ(โปรดระบุ).....

การสื่อสารในองค์กร (Communication)

ข้อ 29. บริษัทฯ ของท่านมีแนวทางการปฏิบัติหรือมาตรฐานในการบริหารความเสี่ยงที่เป็นลายลักษณ์อักษรให้ทั้งหน่วยงาน
รับทราบหรือไม่

- 1. มี เช่นนโยบายการบริหารความเสี่ยง โครงสร้างและแนวทางการบริการความเสี่ยง
- 2. ไม่มี

ข้อ 30. บริษัทฯ ของท่านมีช่องทางสื่อสารที่ชัดเจนเป็นไปยังผู้รับผิดชอบงานหรือไม่

1. มี
 2. ไม่มี

ข้อ 31. บริษัทฯ ของท่านมีแนวคิดอย่างไรในการสื่อสารด้านการบริหารความเสี่ยง

(สามารถเลือกได้หลายข้อ)

1. การบริหารความเสี่ยงถือเป็นส่วนหนึ่งของวัฒนธรรมในองค์กร
 2. สื่อสารและประกาศอย่างชัดเจนถึงนโยบายและขั้นตอนการปฏิบัติงาน
 3. นโยบายและขั้นตอนการปฏิบัติงานเป็นลายลักษณ์อักษร
 4. มีการกำหนดการบริหารความเสี่ยงในหน้าที่งานหรือในคู่มือการปฏิบัติงานอย่างชัดเจน
 5. ทุกคนในองค์กรต้องเซ็นชื่อรับทราบเป็นลายลักษณ์อักษร
 6. ใช้พนักงานจัดทำรายงานการประเมินตนเอง
 7. ให้ผู้บริหาร/ผู้อำนวยการ/กรรมการบริษัทจัดทำรายงานการประเมินตนเอง
 8. มีช่องทางให้พนักงานร้องเรียนเรื่องต่าง หรือมีนโยบายทางด้าน whistleblower system
 9. มีหน่วยงานนักลงทุนสัมพันธ์
 10. เปิดเผยข้อมูลต่างๆ ใน Website ของบริษัท
 11. เปิดเผยข้อมูลต่างๆ ในรายงานประจำปี
 12. อื่นๆ(โปรดระบุ).....

การอบรมและพัฒนา (Training and Development)

ข้อ 32. บริษัทฯ ของท่าน ได้มีจัดการอบรมให้แก่ผู้บริหารหรือไม่

1. มี
 2. มี และมีการอบรมด้านการบริหารความเสี่ยงโดยเฉพาะ
 3. ไม่มี

ข้อ 33. บริษัทฯ ของท่าน ได้มีจัดการอบรมสำหรับพนักงานทั่วไปหรือไม่

1. มี
 2. มี และมีการอบรมด้านการบริหารความเสี่ยงโดยเฉพาะ
 3. ไม่มี

เทคโนโลยี (Information System and Technology)

ข้อ 34. ระบบเทคโนโลยีสารสนเทศที่บริษัทฯ ของท่าน ใช้อยู่ในปัจจุบัน สามารถให้ข้อมูลในการระบุความเสี่ยง ประเมิน และตอบสนองกับความเสี่ยงหรือไม่

1. มี
 2. ไม่มี

ข้อ 35. บริษัทฯ ของท่านมีระบบเทคโนโลยีสารสนเทศใดเพื่อการบริหารความเสี่ยง

(สามารถเลือกได้หลายข้อ)

1. โปรแกรมหรือระบบการบริหารความเสี่ยง Risk Management System
 2. ใช้ระบบอีอาร์พี (Enterprise Resource Planning) ที่รู้จัก เช่น SAP Oracle

- 3. มีแผนการสำรองข้อมูลหรือแผนฉุกเฉินทางระบบสารสนเทศ
- 4. ระบบแผนการประมาณการ (Business Outlook Projection)
- 5. มีระบบเทคโนโลยีและสารสนเทศที่มีประสิทธิภาพ
- 6. มีการใช้ระบบเทคโนโลยีและสารสนเทศเฉพาะบางแผนกเท่านั้น เช่นแผนกบัญชีและการเงิน
- 7. อื่นๆ(โปรดระบุ).....

ข้อ 36. ใครที่มีหน้าที่รับผิดชอบต่อความถูกต้อง ครบถ้วน และความทันเวลาของข้อมูลสำหรับผู้ที่มีส่วนได้เสียกับบริษัทฯ ของท่าน (สามารถเลือกได้หลายข้อ)

- 1. คณะกรรมการบริษัท (Board of Directors)
- 2. คณะกรรมการการตรวจสอบ (Audit Committee)
- 3. หน่วยงานเทคโนโลยีและสารสนเทศ (IT Department)
- 4. หน่วยงานตรวจสอบและการควบคุมภายใน (Internal audit and internal control department)
- 5. ทุกแผนกและหน่วยงานที่มีรับผิดชอบ (Every responsible Departments and business units)

การติดตามผล (Monitoring)

ข้อ 37. บริษัทฯ ของท่าน ได้มอบหมายให้ผู้มีหน้าที่รับผิดชอบ ติดตามการบริหารความเสี่ยงอย่างต่อเนื่อง

- 1. มี
- 2. ไม่มี

ข้อ 38. บริษัทฯ ของท่านมีวิธีหรือเทคนิคใดในการติดตามการบริหารความเสี่ยง

(สามารถเลือกได้หลายข้อ)

- 1. ตั้งระบบการเตือนภัยล่วงหน้าสำหรับการดำเนินงานผิดปกติ
- 2. การประเมินผลจากประกอบการของบริษัทอย่างสม่ำเสมอ
- 3. เปรียบเทียบจากมาตรฐานการปฏิบัติงาน หรือ Best practice
- 4. เทคนิค Balanced scorecards หรือ Key Performance Indicators (KPI)
- 5. วิเคราะห์จากผลการดำเนินงานและอัตราส่วนการการเงิน
- 6. มีการรายงานต่อผู้บังคับบัญชาอย่างเป็นระบบ
- 7. อื่นๆ(โปรดระบุ).....

ส่วนที่ 3 ข้อมูลเกี่ยวกับผู้ตอบแบบสอบถาม

ข้อ 1. อายุ

- 1. น้อยกว่า 35 ปี
- 2. ตั้งแต่ 35-45 ปี
- 3. ตั้งแต่ 46-55 ปี
- 4. มากกว่า 55 ปีขึ้นไป

ข้อ 2. ระดับการศึกษาสูงสุด

- 1. ปริญญาตรี
- 2. ปริญญาโทหรือสูงกว่า

ข้อ 3. จำนวนปีที่ทำงานในบริษัทนี้

- 1. น้อยกว่า 5 ปี
- 2. ตั้งแต่ 5-10 ปี
- 3. ตั้งแต่ 11-15 ปี
- 4. ตั้งแต่ 16-20 ปี
- 5. มากกว่า 20 ปีขึ้นไป

ข้อ 4. ตำแหน่งในปัจจุบัน

- 1. ผู้บริหารระดับสูง
- 2. คณะกรรมการด้านต่างๆ เช่น ด้านการบริหารความเสี่ยง หรือด้านการตรวจสอบ
- 3. ผู้จัดการด้านการบริหารความเสี่ยง
- 4. ผู้จัดการฝ่ายบัญชีและการเงิน
- 5. ผู้จัดการ
- 6. เจ้าหน้าที่ระดับอาวุโส
- 7. อื่นๆ(โปรดระบุ).....

ข้อ 5. ท่านยินดีที่จะให้ข้อมูลเพิ่มเติมด้านการบริหารความเสี่ยง หรือสนใจให้ติดต่อกลับเพื่อสนใจเข้าร่วมวิเคราะห์การบริหารความเสี่ยงในบริษัทฯ ของท่าน

- 1. ยินดี
ชื่อผู้ติดต่อ :
- แผนก :
- เบอร์โทรติดต่อ :
- 2. ไม่สนใจ



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ส่วนที่ 4 ข้อเสนอแนะและตอบรับข้อมูลวิจัย

ข้อเสนอแนะเพิ่มเติม :

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หากท่านต้องการผลการประเมินการบริหารความเสี่ยงในภาพรวมของบริษัทจดทะเบียนในตลาดหลักทรัพย์แห่งประเทศไทย กรุณาให้อีเมลล์ของท่าน ผู้วิจัยจะส่งผลการวิจัยหลังจากงานวิจัยเสร็จสิ้น

ชื่อผู้ติดต่อ :

Email :

ขอขอบคุณที่ท่าน ได้กรุณาสละเวลาอันมีค่าในการช่วยตอบแบบสอบถามฉบับนี้