

Doctoral Dissertation

**Management of Risk in
Small Medium Enterprises (SMEs)**

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Nusaibah binti Mansor

Graduate School of Business Administration and Computer Science

Aichi Institute of Technology

TABLE OF CONTENT

CHAPTER 1

INTRODUCTION

1.1	General Introduction.....	1
1.2	Research Problems.....	2
1.3	Research Objectives.....	3
1.4	Organization of Dissertation.....	4

CHAPTER 2

ANALYZING RISK MANAGEMENT TREND AND PATTERN USING CORRESPONDENCE ANALYSIS: TEXT MINING APPROACH

2.1	Introduction.....	6
2.2	ISO 31000:2009 Risk Management.....	7
2.2.1	Establish Goals and Context.....	10
2.2.2	Identify the Risks.....	11
2.2.3	Analyze the Risk.....	12
2.2.4	Evaluate the Risk.....	13
2.2.5	Treat the Risk.....	13
2.2.6	Monitoring the Risk.....	13
2.2.7	Communication and Reporting.....	14
2.3	Objective of Study.....	17
2.3	Methodology.....	17
2.3.1	Text Mining.....	17
2.3.2	Correspondence Analysis.....	19
2.3.3	Cluster Analysis.....	21
2.4	Conclusion.....	24

CHAPTER 3

DETERMINING RISKS ON NEW PRODUCT DEVELOPMENT (NPD) PERFORMANCE IN SMALL MEDIUM ENTERPRISES (SMES)

3.1	Introduction.....	26
-----	-------------------	----

3.2	Methodology.....	28
3.3	Results and Discussion.....	30
3.3.1	Risk Management.....	30
3.3.2	Risk Management in NPD.....	31
3.3.2.1	Technology Risk.....	34
3.3.2.2	Marketing Risk.....	37
3.3.2.3	Organizational Risk.....	38
3.3.2.4	Financial Risk.....	39
3.3.3	NPD Performance in SMEs.....	42
3.4	Conclusion.....	46

CHAPTER 4

PERCEIVENESS OF NEW PRODUCTS

4.1	Introduction.....	47
4.1.1	Consumer Perspective on Green Buying.....	49
4.2	Hypotheses Development.....	50
4.3	Methodology.....	51
4.4	Data Collection and Analysis.....	51
4.5	Results and Discussion.....	52
4.6	Conclusion.....	53

CHAPTER 5

MANAGING NEW PRODUCT DEVELOPMENT RISK: A COMPARISON BETWEEN JAPAN AND MALAYSIA SMES

5.1	Introduction.....	55
5.1.1	SMEs in Japan.....	56
5.1.2	SMEs in Malaysia.....	57
5.2	Theoretical Background and Literature Review.....	60
5.2.1	Operational Risk.....	60
5.2.2	Technological Risk.....	61
5.2.3	Marketing Risk.....	62
5.3	Methodology.....	64
5.3.1	Sampling and Data Collection.....	64

5.4	Analysis and Results.....	65
5.4.1	Operational Risk.....	66
5.4.1.1	Product Development Team.....	66
5.4.1.2	Experts Advice on NPD.....	68
5.4.2	Technology Risk.....	70
5.4.2.1	IT Adoption.....	70
5.4.2.2	ISO and Guidelines Adoption.....	72
5.4.3	Marketing Risk.....	73
5.4.4	Type of Risk.....	75
5.4.5	NPD Performance.....	76
5.5	Conclusion.....	77

CHAPTER 6

CONCLUSIONS.....	78
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REFERENCES.....	81
-----------------	----

ACKNOWLEDGEMENT.....	93
----------------------	----

LIST OF PUBLICATIONS.....	94
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CHAPTER 1

INTRODUCTION

1.1 GENERAL INTRODUCTION

Managing risks is a strategic challenge for organizations, which must face threats increasingly complex and diverse. Uncertainty and risk-taking are inherent in most policy decisions, particularly when they have major long-term impacts. Whether they are considering launching a new product, introducing a new process or new technology, acquiring another business, constructing a new factory or establishing policies or regulations affecting management, leaders must assess not only the potential benefits of these measures, but also the risks associated with them. The goal of the risk management is to establish the feasibility of the project within the organizational management structure, technology level, human resource capability, financial situation, and within the production and marketing level that limit its own business. Risk management by definition is the identification, assessment, and prioritization of risks followed by coordinated and economical application of resources to minimize, monitor, and control the probability and/or impact of unfortunate events or to maximize the realization of opportunities.

1.2 RESEARCH PROBLEMS

Several empirical studies found evidence showing that 50 % of small and medium-sized enterprises (SMEs) close down before completing their fifth year, it is clear that operating a business can be a risky. Risk has consequences in terms of economic performance and professional reputation, but there are also environmental, safety and social considerations. These risks may be internal or external, direct or indirect. Despite the underlying element of uncertainty, it is often possible to predict risks, and to set in place systems and design actions to minimize their negative consequences and maximize the positive ones. Those risks that arise from disorder can be controlled through better management and governance. In this manner, businesses that adopt a risk management strategy are more likely to survive and to grow. Large firms are better equipped and relatively well structured to deal with risks while maximizing benefits. By contrast, due to various limitations, SMEs are more exposed to the negative aspects of risks. However, due to their flexibility, and if provided with the right tools, they can tap into opportunities to increase their market share, grow and manage risk more effectively.

The importance of small medium enterprises (SMEs) is widely recognized to be part of national economic development whether in developed or developing countries and they form the very basis of every country's economy. Their role as an engine in creating job opportunities and contribution to economic growth put them in one of main national economic policy. One of primary success of SMEs to sustain in competitive market and contribute to economic growth is

through developing new product, in other word is developing and commercializing innovations. It is well known that SMEs constitute the vast majority of enterprises around the world, and serve as the mainstay of trade and economic growth. They serve as key drivers of innovation, social integration, and employment, representing 60 % of private sector jobs. Given the importance of SMEs to economic growth and development, attention to the issue of SME risk management becomes quite essential. SMEs have little guidance on how best to manage risk and where to turn to for advice. Studies find that while most SMEs adopt some form of loss prevention and reduction measures, they do not engage in a formal risk management process and vast majority totally ignore risk treatment.

1.3 RESEARCH OBJECTIVES

Risk management may help SMEs to mitigate significant risks that could otherwise impede their move to success (Kim and Vonortas, 2014). Failure to manage risks will lead to unwanted consequences such as losing customers, environmental damage and even bankruptcy. Nevertheless, most SMEs do not have sufficient capacity to apply risk management practices, mostly because they cannot afford to rededicate resources due to their constraints. Most studies are fragmented when it comes to risk management and new product development in SMEs. Research in risk management on SMEs mostly delves into strategic action but not risk management in new product development in SMEs (Kim and Vonortas, 2014; Falkner and Hiebl, 2015; Altman et al., 2010).

Therefore this research objective concentrates on risk management in SMEs as well comparative study carry out between developed and developing countries.

1.4 ORGANIZATION OF DISSERTATION

The main content of this dissertation is divided into Introduction, Chapters 2-5, Conclusions and Bibliography. Chapter 2 gives a definition of risk management from different perspectives. It highlighted the early introduction of risk management standard namely ISO 31000:2009, *Risk management – Principles and guidelines*, a generic guideline that provides principles, framework and a process for managing risk. It can be used by any organization regardless of its size, activity or sector. The chapter delves further by looking at trend and pattern before and after the introduction of ISO 31000: 2009 specifically in Japan. A text mining approach is deployed and using correspondence analysis to seek the trend and pattern of risk management over 10 years period. The analysis resulted in three clusters specifically risk introduction, risk treatment and risk evaluation explained further in the chapter.

Chapter 3 discovers risk factors effect on small medium enterprises (SMEs). Using systematic reviewing, vast collections of journal articles and documents in database were screen through using related keywords. The findings of risk factors affecting SMEs were discussed. Risk on new product development (NPD) in SMEs is chosen to be focus more into the subject matter. Four risk factors are identified to relatedly affect SMEs performance in NPD project.

Chapter 4 mainly discusses the investigation of risk effect on SMEs in Malaysia during NPD project. Using four risk factors identified in Chapter 3 before, the study found significant effects of risk on the performance of NPD.

Chapter 5 focuses on comparative study done between Japan and Malaysia SMEs. The findings found that both developed and developing countries perceive risk as the same. However there is slight difference in findings which on the adoption of ISO standard. Finally in chapter 6 summaries the results that have been obtained in this dissertation.

CHAPTER 2

ANALYZING RISK MANAGEMENT TREND AND PATTERN USING CORRESPONDENCE ANALYSIS: TEXT MINING APPROACH

2.1 INTRODUCTION

Risk is where it concerns of company trying to achieve objectives against uncertain environment (JIS, 2010; Noguchi, 2009). Addressing and managing risk are major challenges for leaders and a key component of strategic management. Uncertainties may come from internal or external factors, which the outcomes might be positive or negative (Aven, 2012). Before the introduction of ISO 31000:2009, there are many different definitions of risk and risk management process elements and many different versions of the process to be followed. For these reasons, ISO, the international body responsible with achieving standardization, set out to achieve consistency and reliability in risk management by creating a standard that would be applicable to all forms of risk (Purdy, 2010).

2.2 ISO 31000: 2009 RISK MANAGEMENT

Risk management is not new tool and a lot of standards and guidance documents are available. It is an integral component of good management and decision-making at all levels of an organization. All departments in an organization manage risk continuously whether they realize it or not, sometimes more rigorously and systematically, sometimes less. More rigorous risk management occurs most visibly in those departments whose core mandate is to protect the environment and public health and safety. At present, a further generic standard on risk management has introduced a common ISO/IEC standard (IEC 2007) describing a systemic top down as well as a functional bottom up approach. This standard is intended to support existing industry or sector specific standards. Like most other ISO management standards, ISO 31000 provides a structured framework intended to meet the needs of any type of organization or situation. In Figure 2.1, illustrates risk management process. The whole process is a continual improvement in implementing risk management system in organization (Lalonde and Olivier, 2012).

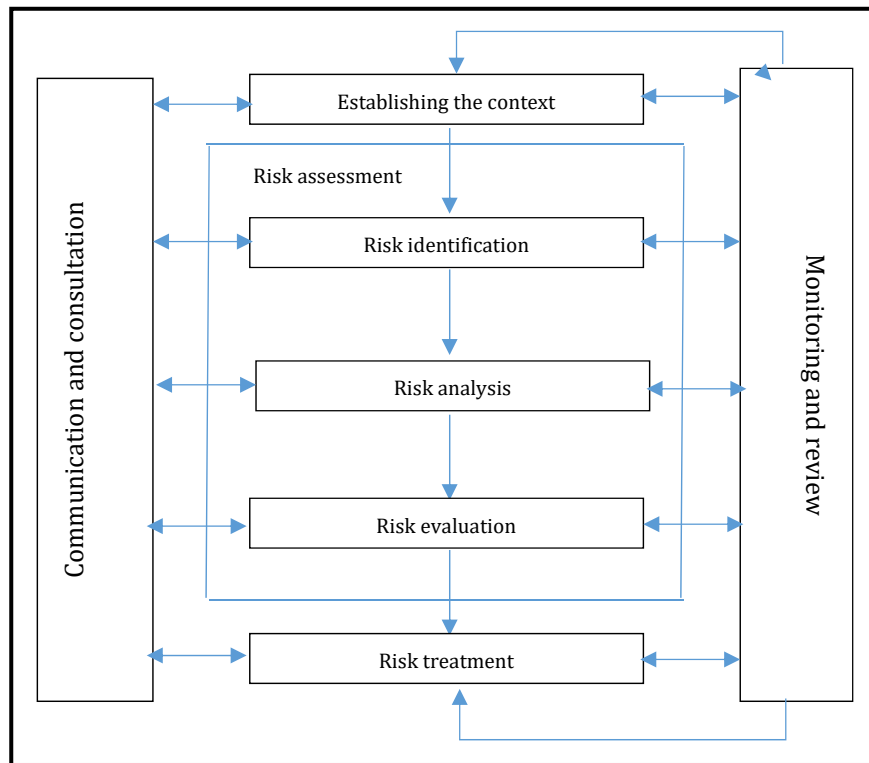


Figure 2.1 Risk Management Process

The standard also provides framework, which describes the important elements that are required in the framework, but also describes how an organization should go about creating, implementing, and keeping these elements up to date and relevant. Figure 2.2 shows risk management framework outline by ISO standard.

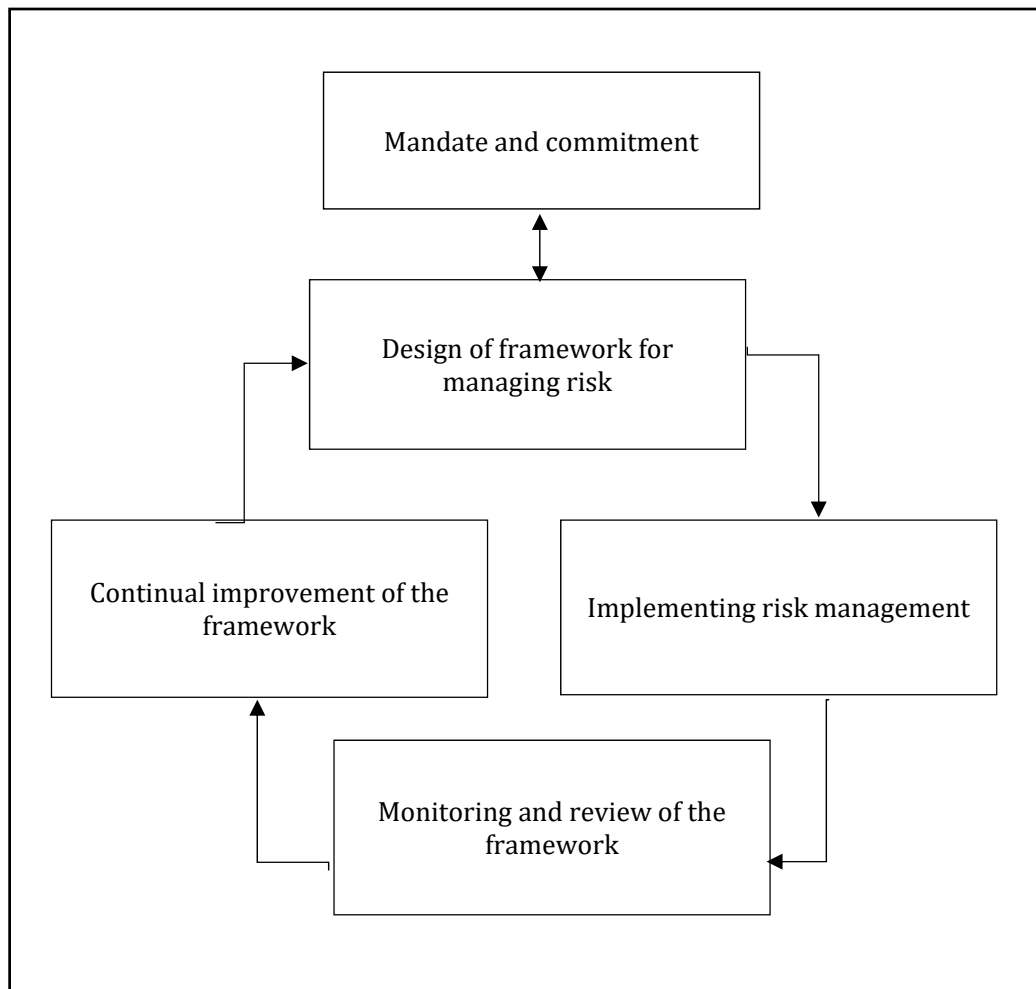


Figure 2.2 Risk Management Framework

Referring to Figure 2.1, the risk management steps are:

1. Establishing goals and context
2. Identifying risks,
3. Analyzing the identified risks,
4. Assessing or evaluating the risks,
5. Treating or managing the risks,
6. Monitoring and reviewing the risks and the risk environment regularly, and
7. Continuously communicating, consulting with stakeholders and reporting.

The next point will elaborate further on each steps of risk management that include all the seven steps.

2.2.1 Establish Goals and Context

The purpose of this stage of planning enables to understand the environment in which the respective organization operates, that means to thoroughly understand the external environment and the internal culture of the organization. The analysis is undertaken through establishing the strategic, organizational and risk management context of the organization, and identifying the constraints and opportunities of the operating environment.

The establishment of the context and culture is undertaken through a number of environmental analyses that include, e.g., a review of the regulatory requirements, codes and standards, industry guidelines as well as the relevant corporate documents and the previous year's risk management and business plans. Part of this step is also to develop risk criteria. The criteria should reflect the context defined, often depending on internal policies, goals and objectives of the organization and the interests of stakeholders. Criteria may be affected by the perceptions of stakeholders and by legal or regulatory requirements. It is important that appropriate criteria be determined at the outset. Although the broad criteria for making decisions are initially developed as part of establishing the risk management context, they may be further developed and refined subsequently as particular risks are identified and risk analysis techniques are chosen. The risk criteria must correspond to the type of risks and the way in which risk levels are expressed.

2.2.2 Identify the Risks

Using the information gained from the context, the next step is to identify the risks that are likely to affect the achievement of the goals of the organization, activity or initiative. It should be underlined that a risk can be an opportunity or strength that has not been realized.

Specific lists, for example from standards, and organizational experience support the identification of internal risks. To collect experience available in the organization regarding internal risks, people with appropriate knowledge from the different parts of the organization should be involved in identifying risks. Creativity tools support this group process. The identification of the sources of the risk is the most critical stage in the risk assessment process. The sources are needed to be managed for pro-active risk management. The better the understanding of the sources, the better the outcomes of the risk assessment process and the more meaningful and effective will be the management of risks. Risk identification of a particular system, facility or activity may yield a very large number of potential accidental events and it may not always be feasible to subject each one to detailed quantitative analysis. In practice, risk identification is a screening process where events with low or trivial risk are dropped from further consideration. However, the justification for the events not studied in detail should be given. Quantification is then concentrated on the events which will give rise to higher levels of risk. Fundamental methods such as Hazard and Operability (HAZOP) studies, fault trees, event tree logic diagrams and Failure Mode and Effect Analysis (FMEA) are tools which can be used to identify the risks and assess the criticality of possible outcomes.

2.2.3 Analyze the Risk

Risk analysis involves the consideration of the source of risk, the consequence and likelihood to estimate the inherent or unprotected risk without controls in place. It also involves identification of the controls, an estimation of their effectiveness and the resultant level of risk with controls in place (the protected, residual or controlled risk). Qualitative, semi-quantitative and quantitative techniques are all acceptable analysis techniques depending on the risk, the purpose of the analysis and the information and data available.

Often qualitative or semi-quantitative techniques can be used for screening risks whereas higher risks are being subjected to more expensive quantitative techniques as required. Risks can be estimated qualitatively and semi-quantitatively using tools such as hazard matrices, risk graphs, risk matrices or monographs but noting that the risk matrix is the most common. Applying the risk matrix, it is required to define for each risk its profile using likelihood and consequences criteria. Typical definitions of the likelihood and consequence are contained in the risk matrix.

Using the consequence criteria provided in the risk matrix, one has to determine the consequences of the event occurring (with current controls in place). To determine the likelihood of the risk occurring, one can apply the likelihood criteria (again contained in the risk matrix). As before, the assessment is undertaken with reference to the effectiveness of the current control activities.

To determine the level of each risk, one can again refer to the risk matrix. The risk level is identified by intersecting the likelihood and consequence levels on

the risk matrix. Complex risks may involve a more sophisticated methodology. For example, a different approach may be required for assessing the risks associated with a significantly large procurement.

2.2.4 Evaluate the Risk

Once the risks have been analyzed they can be compared against the previously documented and approved tolerable risk criteria. When using risk matrices this tolerable risk is generally documented with the risk matrix. Should the protected risk be greater than the tolerable risk then the specific risk needs additional control measures or improvements in the effectiveness of the existing controls. The decision of whether a risk is acceptable or not acceptable is taken by the relevant manager.

2.2.5 Treat the Risk

An unacceptable risk requires treatment. The objective of this stage of the risk assessment process is to develop cost effective options for treating the risks. Treatment options, which are not necessarily mutually exclusive or appropriate in all circumstances, are driven by outcomes that include avoiding the risk, reducing (mitigating) the risk, transferring (sharing) the risk, and retaining (accepting) the risk.

2.2.6 Monitoring the Risk

It is important to understand that the concept of risk is dynamic and needs periodic and formal review. The currency of identified risks needs to be regularly monitored. New risks and their impact on the organization may to be

taken into account. This step requires the description of how the outcomes of the treatment will be measured. Milestones or benchmarks for success and warning signs for failure need to be identified. The review period is determined by the operating environment (including legislation), but as a general rule a comprehensive review every five years is an accepted industry norm. This is on the basis that all plant changes are subject to an appropriate change process including risk assessment.

The review needs to validate that the risk management process and the documentation is still valid. The review also needs to consider the current regulatory environment and industry practices which may have changed significantly in the intervening period. The organization, competencies and effectiveness of the safety management system should also be covered. The plant management systems should have captured these changes and the review should be seen as a 'back stop'. The assumptions made in the previous risk assessment (hazards, likelihood and consequence), the effectiveness of controls and the associated management system as well as people need to be monitored on an on-going basis to ensure risk are in fact controlled to the underlying criteria. For an efficient risk control the analysis of risk interactions is necessary.

2.2.7 Communication and Reporting

Clear communication is essential for the risk management process, for example clear communication of the objectives, the risk management process and its elements, as well as the findings and required actions as a result of the output. Risk management is an integral element of organization's management.

However, for its successful adoption it is important that in its initial stages, the reporting on risk management is visible through the framework. The requirements on the reporting have to be fixed in a qualified and documented procedure, e. g., in a management handbook. The content of such a handbook is shown in Figure 7. Documentation is essential to demonstrate that the process has been systematic, the methods and scope identified, the process conducted correctly and that it is fully auditable. Documentation provides a rational basis for management consideration, approval and implementation including an appropriate management system.

A documented output from the above sections (risk identification, analysis, evaluation and controls) is a risk register for the site, plant, equipment or activity under consideration. This document is essential for the on-going safe management of the plant and as a basis for communication throughout the client organization and for the on-going monitor and review processes. It can also be used with other supporting documents to demonstrate regulatory compliance.

While people working in the many different forms of risk management always have the same goal, to provide a sound basis for decisions on whether risks are acceptable and, if necessary, obtain reliable information how they can be dealt with, there are many different definitions of risk and of the risk management process elements and many different versions of the process to be followed. These have all developed for good historical reasons but individuals and organizations, whether they are for profit or not, regulated or regulator, need to

make confident and balanced decisions about all risks they have to deal with, on a consistent and reliable basis. Decision makers are uncomfortable about resolving pieces of apparently similar but fundamentally different information, obtained from different processes and with different assumptions, that are described using the same words but that have different meanings.

As the international standard on risk management established in 2009, it is also seen as significant to standardize the risk management standard in Japan when JIS Q 31000 then formulated in September 2010 to be easily adopted by locals. This is developed based on the ISO 31000 international standard of risk management, without altering technical contents and structure. The standard does not target any specific field but intends to be a generic standard that will provide guidelines to apply risk management to diverse organizations and businesses (JIS, 2010).

Japan organizations have long integrated risk management into their management practices. In 1995 after the Great Hanshin Awaji Earthquake, most institutions in Japan intensively deployed risk management standards. It is more recognize as crisis management in Japan rather than risk management, although both are theoretically the same (Morimiya, 2010).

Business and economic landscape always change thus making it uncertain and risky. Therefore, the understanding of changes in risk management evolvement throughout the years before and after the introduction of risk management

standard will provide insight view on its current development and the importance and effect of it.

2.2 OBJECTIVE OF STUDY

It is important to study trend and pattern of risk management is as it could provide an understanding of foundational in this field. One way of studying it is by using textual mining approach. Hence the objective of this study is to analyze risk management trend and pattern before and after the introduction of ISO 31000:2009 using text-mining methodology. Text mining method applications among others is to extract relevant information from a document. It is also typically used to gain insights about trends and patterns by automatically aggregating and comparing information extracted from documents of a certain type (Salamin and Hanappi, 2014). Therefor this study in hope will enlighten our understanding of risk management over the years.

2.3 METHODOLOGY

2.3.1 Text Mining

Text mining is a sub-specialty of knowledge discovery from data. The process of utilizing computers to extract useful information from vast volumes of digital content. Low-level data are transformed to richer data by detecting meaningful themes implicitly present in the data to further elaborate more on subject matter.

Text mining utilizes the research procedures of text analysis techniques to uncover useful information buried in text documents. Text mining involves

unstructured text documents. In this paper, it will focus on online text mining. It is defined as the process of searching through unstructured data on the Internet and deriving useful business intelligence from it (Leong et.al, 2004).

In order to analyze the trend and pattern of risk management before and after the introduction of risk management standard, R statistical tools are deployed to achieve the objective. This text mining method using MeCab and RMeCab tools in R software is unique because it is capable of capturing Japanese sentences in which also helpful for non-native speaker. The software is expected to capture and extract nouns and adjectives which interest and important to risk management.

Initially, a total of 1,291 news articles in Japanese language managed to be filtered from Nikkei Newspaper database by looking up terms such as risk management, risk assessment, risk analysis and risk standard. The searching of articles expand over a period of 9 years, starts from 2006 until 2014. Once those articles are analyzed using RMeCab, it resulted in producing categorical data with two main categories, year and word. Further step is by screening through all the captured words, and irrelevant characters such as numbers, hyphen, and so on then are omitted. It then resulted to only 75 relevant words. This screening is done to ensure the accuracy and importance of words in the articles captured related to risk management. The identified most frequent words are then analyzed using correspondence analysis.

2.3.2 Correspondence Analysis

Correspondence analysis is chosen as it is suitable to further explore textual data in this study. The analysis is a multivariate technique that analyzes a data table in which observations are described by several inter-correlated quantitative dependent variables (Clausen, 1998). The analysis presents the proportion structure of elements in the columns and rows of a contingency table in the form of points in a space with lower dimensionality. Unlike component analysis which only can analyze continuous data, correspondence analysis can accept nominal, ordinal and interval data. Furthermore, correspondence analysis particularly suitable for textual analysis and, in particular, for the analysis of short texts of high content density (Jowkar and Fereshteh, 2010). The result from correspondence analysis is then plotted in scatterplot graph, which shows in Figure 2.3.

From categorical data, correspondence analysis resulted in two category; words and scores. In order to interpret the result, scatterplot graph is used to illustrate trend and pattern of risk management. Each words are plotted in X and Y-axis in the graph using Microsoft Excel. The graph shows distribution of words and their position in Figure 2.3.

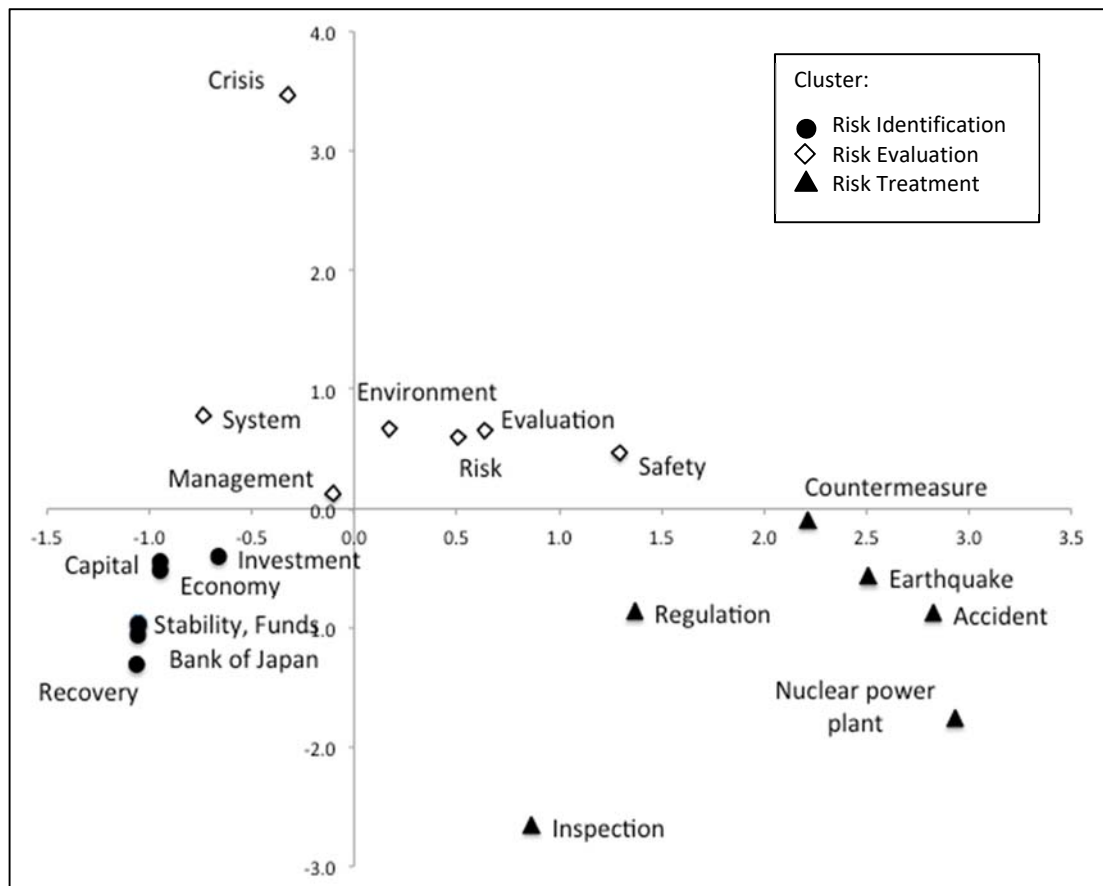


Figure 2.3 Scatterplot of Correspondence Analysis

Referring to Figure 2.3 most discussed issues on risk management is in 2011 when earthquake with the scale of magnitude 9 occurred. Earthquake that led to many chain events are tsunami, nuclear power plant accident and radioactive contamination in Tohoku region. But most severely destructed areas are Fukushima, Iwate and Miyagi prefectures caused 15,854 people died. Among other words appear under this discussion is power plant, regulation, safety and countermeasure. Safety issues are raised mostly on nuclear power plant management. Due to the nature of power plant industry, stringent rules to be complied, emphasize on risk management is taken seriously. This came into highlight when there are loopholes in safety guidelines of nuclear power plant. It is stated in the safety guidelines by Japan government on how power plant

company should react when met with power failure. However, overconfident over the assumption that the existing guidelines sufficient to tackle risk which later led to Fukushima power plant accident (Kinoshita, 2013).

2.3.3 Cluster Analysis

Looking at the scatterplot graph in Figure 2.3, we can see distribution of words based on scores. The distribution of data resulted in three main clusters. Three main identified clusters are, risk identification, risk evaluation and risk treatment. The first discussion is on risk identification illustrates in Figure 2.4.

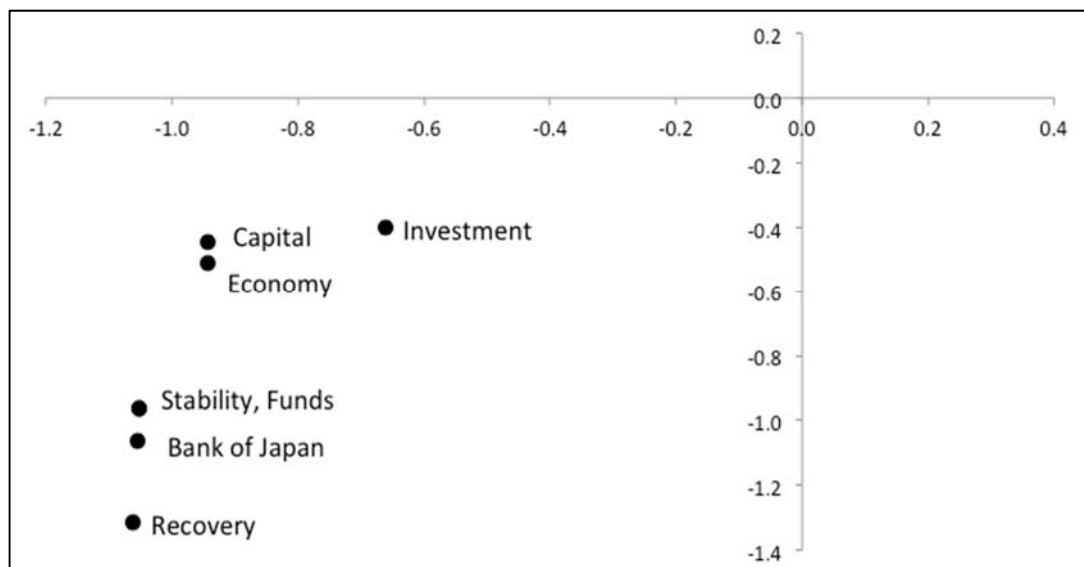


Figure 2.4 Risk Identification Cluster

In risk management, risk identification is a process starts through defining what the organization wants to achieve and the external and internal factors that may influence success in achieving those objectives. This step is called establishing the context and is an essential precursor to risk identification.

Most appeared words in this cluster related to financial and banking sector such as investment, Bank of Japan, stability, economy, recovery, fund and capital. Due to its highly competitive industry, financial and banking sector are one of the main industries known among the earliest to incorporate risk management into their management systems. In 2008, financial crisis hit the world market affected severely on financial and banking sector. Therefore, risk management is widely discussed in this particular year because of the essential role it plays in keeping companies survival.

Second cluster identified from the graph is risk evaluation shows in Figure 2.5. Risk evaluation defines as making a decision about the level of risk and the priority for attention through the application of the criteria developed when the context was established. Among other words appear in the cluster are risk, safety, environment, crisis and evaluation. In this cluster highlight the introduction of ISO 73:2009 Risk Management Vocabulary intended to provide the definitions of generic terms related to risk management.

Risk management standard in Japan poses challenges to existing management system because of several aspects. One is the standard is not align with existing management system of companies. Instead of incorporated it into existing management system, company tend to separate risk issues which leads to unforeseen treats and obstacles. Most companies also view and perceive risk as negative. However, the introduction of risk management standard provides better understanding of risk and be treated as positive thing as well. Whereby companies may able to forecast coming uncertainties or risks and handle it better.

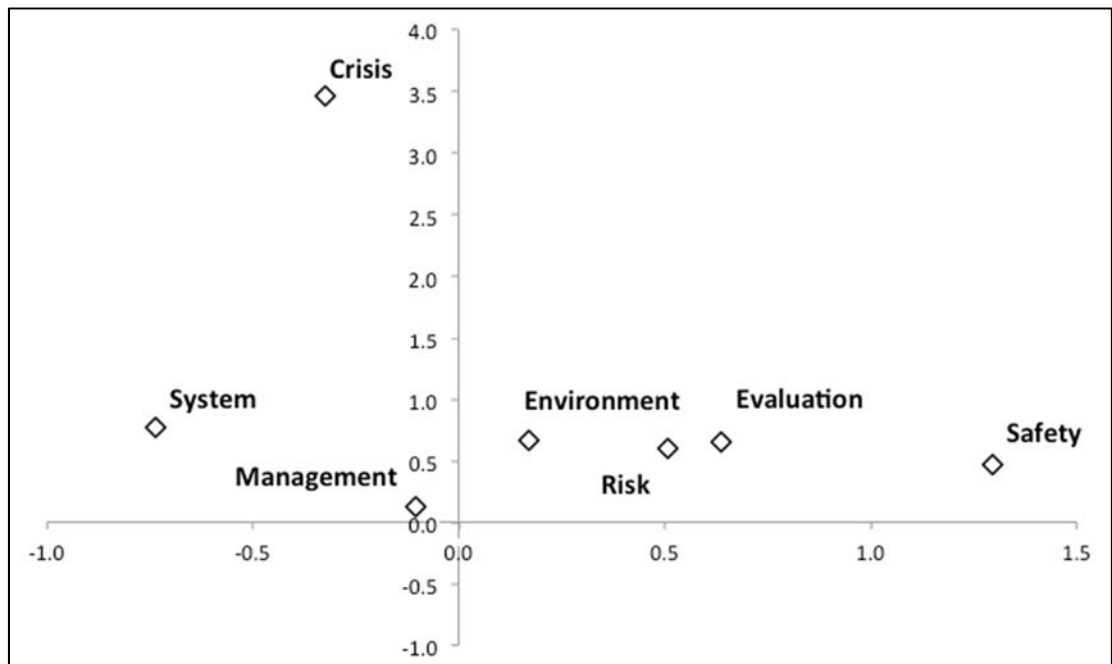


Figure 2.5 Risk Evaluation Cluster

The last cluster identified is risk treatment shows in Figure 2.6. Risk treatment is the process by which existing controls are improved or new controls are developed and implemented. It involves evaluation of and selection from options, including analysis of costs and benefits and assessment of new risks that might be generated by each option, and then prioritizing and implementing the selected treatment through a planned process. If this process is followed, the systematic way in which the risks have been assessed means that risk treatment can be proceed with confidence.

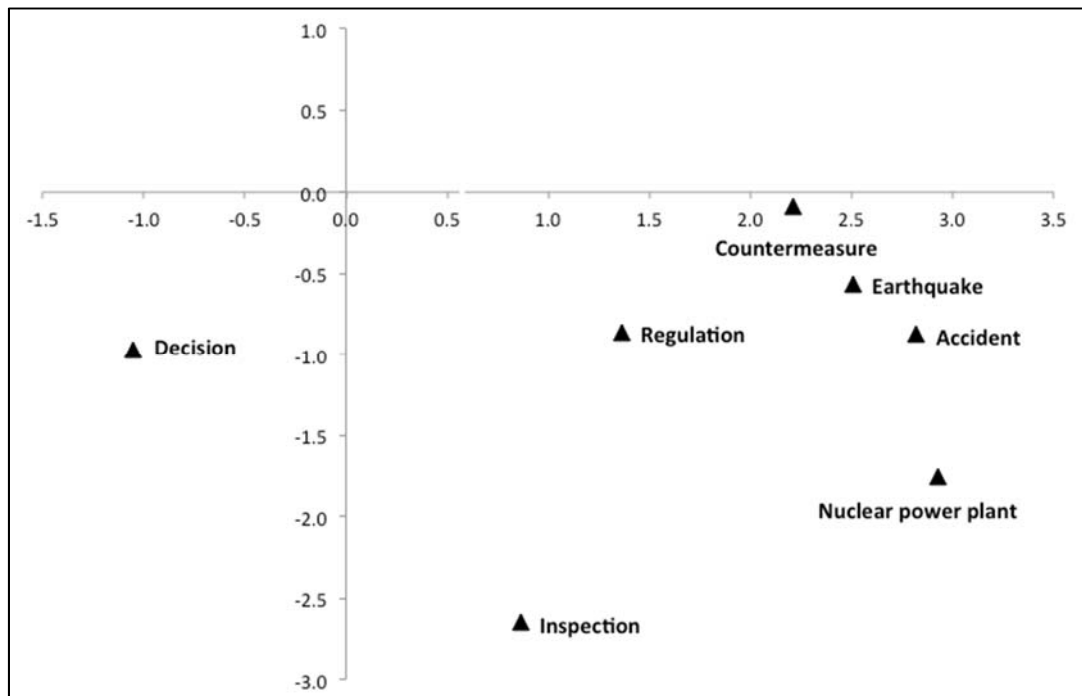


Figure 2.6 Risk Treatment Cluster

In this cluster, among the words appear are nuclear power plant, accident, earthquake, regulation, inspection and countermeasure. These words came out as Great East Japan earthquake occurred in 2011. A lot of academic discussion on this issue due to chain events occurred from the earthquake. It is a wakeup call especially those in the nuclear power plant industry to take more proactive countermeasure in risk and safety issues.

2.4 CONCLUSION

According to the Society for Risk Analysis Japan, the publics rarely discuss about risk and there is lack of dialogue concerning risk in Japan. After the Great East Japan Earthquake, active move has been made to close the gap of understanding

on risk started. Proactive communication and actions about risks are carry out by different agencies to levitate understanding on risks issues. Different industries perhaps have different understanding on risk based on their sector. But when it comes to risk, whether from public or private sector there is a need to build a bridge to connect mutual and coherent understanding in risk communication. The analysis done in this paper in hope will shed some light on risk management trends and pattern in Japan through text mining and correspondence analysis.

CHAPTER 3

DETERMINING RISKS ON NEW PRODUCT DEVELOPMENT (NPD) PERFORMANCE IN SMALL MEDIUM ENTERPRISES (SMES)

3.1 INTRODUCTION

Small and medium-sized enterprises (SMEs) are the backbone of most economies globally. In most countries, SMEs account for more than 90 percent of all established companies (Ayyagari, 2007). They are known to create jobs in the private sector, thus reducing the unemployment rate. In terms of organizational structure, SMEs have a much simpler structure; therefore they are faster and more flexible at responding and adapting to change (Lindman, 2002). Nonetheless, the fact that economic conditions are always unpredictable and the current marketplace is highly competitive, have put SMEs in a position where they need to find ways to survive in such an environment. Numerous studies agree that in order to succeed in an intensely competitive environment, SMEs need to take the lead in new product innovation (Laforet, 2008; Nicholas et.al, 2011).

To develop and innovate new products is no easy feat, especially for SMEs, as the NPD process itself is associated with several risks. The product life cycle is becoming shorter, increasing the competition to become the first to introduce new products into the market. Having fewer resources and structural features also results in a greater vulnerability to risk. A study conducted in the UK found that most SMEs find it problematic to implement a new product development process due to some constraints such as poor definition of product requirements. The study highlighted that the process was delayed due to poor understanding of customer requirements and insufficient knowledge of a product's technology and market (Owens, 2000). The same assumption cannot be made for the success of developing new products in small firms compared to large firms because they are severely constrained by limited resources, both human and financial (Ledwith, 2000). They are relatively vulnerable to external events because of a low equity ratio. Compared to larger enterprises, SMEs have weak financial foundations and fewer accesses to resources. This suggests that SMEs are more easily threatened and exposed to risks when it comes to managing NPD.

Risk management may help SMEs to mitigate significant risks that could otherwise impede their move to success in developing new products (Kim and Vonortas, 2014). Failure to manage risks will lead to unwanted consequences such as losing customers, environmental damage and even bankruptcy. Nevertheless, most SMEs do not have sufficient capacity to apply risk management practices, mostly because they cannot afford to rededicate resources due to their constraints. Most studies are fragmented when it comes

to risk management and new product development in SMEs. Research in risk management on SMEs mostly delves into strategic action but not risk management in new product development in SMEs (Kim and Vonortas, 2014; Falkner and Hiebl, 2015; Altman et al., 2010). Therefore this study will address a gap in the literature by linking risk management of NPD to SMEs.

3.2 METHODOLOGY

This study is carried out using method adopted from Tranfield *et al.* (2009) to conduct review on scholar journals and academic literatures. In their paper, the authors evaluate the process of systematic review that was used previously in medical science to be applied in management and business field. The basic steps in conducting systematic review as set out by the authors are divided into three steps which are; planning the review, conducting the review and lastly reporting the review.

The initial step is on planning review that is presented earlier in the introduction section that discusses the direction of this paper. The second step is to conduct the review by identifying relevant research in journal articles on risk management of NPD in SMEs using wide key word using the following database:

- (1) EBSCO Business Source Elite.
- (2) Elsevier Science Direct.
- (3) Emerald Management Extra Plus.
- (4) Google Scholar.
- (5) ProQuest

(6) Scopus.

In order to screen through vast collections of documents in database, main keywords are used with the combination of important words, and also combination of words present in an abstract of an article. The first keyword we look up for is on SMEs. Word such as “small medium enterprises” OR “small firm” OR “SME” OR “medium sized company” OR “small medium sized business” were search in database.

Second keyword is on “risk management” OR “risk” OR “managing risk” or “uncertainties”. And third combination keyword which we search for is “new product development” OR “NPD” or “product development”. Most of the articles extract from high impact journal namely *Journal of Product Innovation Management*, *Technovation*, *The Journal of Risk Finance*, *Small Business Economics*, *Journal of Small Business Management*. The search leads to several journal articles then are further scanned through to fit the criterion of this study. Unfit articles were excluded from further analysis, as they do not made any reference to SME but large company instead. The findings will be discussed and presented in the following sections.

3.3 RESULTS AND DISCUSSION

3.3.1. Risk Management

Risk management can be defined as the process of determining the maximum acceptable level of overall risk for engaging in business activities. In the risk management process, it involves using risk assessment techniques to identify the initial level of risk and then develop a strategy to rectify appropriate individual risks until the overall risk is reduced to an acceptable level. Risk management approaches differ from one firm to the next, whether small or larger firms, which have different, strategic management goals. The importance of risk management is now greater and beyond other issues such as long-term and short-term financing constraints (Plourd, 2009). Recognizing the existence of a risk management strategy is insufficient; enterprises need to actively engage in risk management practices to address the major risks as experienced in the current unpredictable economic climate are impacting both individuals and enterprises.

Across small or larger firms, strategic actions are different; however in terms of managing risks and uncertainties the importance of recognizing it is very crucial in both. Different industries have diverse approach in managing risks. And when International Organization for Standardization (ISO) published ISO31000: 2009 *Risk Management: Principles and Guidelines* in November 2009, it has marked another significant milestones for risk management. Although the standard is still impractical and unclear to follow, there is room to improvise it. The

standard in hope will assimilate understanding of risk management thus have common language and uniformity in understanding risk management.

Where SME is concern, risk management is the core principle on which the entrepreneur or management should be focused, including identifying future uncertainties, measure risks, predicting possible patterns and effects, and formulating plans to address these risks and reduce or eliminate their impact on the enterprise. One of the skills required of entrepreneurs is the ability to identify and analyze risks to ensure that they take calculated risks (Kreiser et al., 2010).

3.3.2 Risk Management in NPD

New product development (NPD) is a process to transform ideas and materialize it into innovative products to eventually move it into the market. It is inherently linked to taking and managing risks, as most activities can be interpreted as a structured reduction of uncertainty. Studies of customer needs and market trends can reduce the uncertainty surrounding requirements to develop new product. This will ensure certainty company's capabilities over technology development, testing and evaluation when undergo NPD process (Mu et al., 2009). Reducing risks in new product development can also increase customer value (Browning et al., 2002), and can be used to analyze and optimize product development processes. Research findings by Moenaert *et al.* (1995) conclude that the more uncertainty is reduced during the new product innovation process, the higher the possibility of the success of commercializing

a new product. The research agrees on the reduction of market uncertainty to ensure commercialization of new products.

Using structured and systematic process to categorize risks in NPD will assist companies to assess and diagnose causes of risks and their level of predictability more easily. Keizer *et al.* (2010) developed a risk management diagnostic methodology for how to manage risk in new product development projects. They emphasize that the risk assessment process is to identify potential risks in four main domains, namely technology, market, finance and operations risks. Mu *et al.* (2009) improved upon prior studies in risk management on NPD by proposing a three-dimensional risk management framework for NPD. Their framework emphasizes that firms can identify, analyze, respond to, and monitor the major risks in the NPD process by various means such as learning from customers and other entities, sourcing external knowledge, and integrating specialized knowledge internally. Park (2010) classified risks in NPD into two categories, external and internal risks. The author identified internal risk as operational risks, technology risks, and organizational risks, meanwhile external risks are as market risks and supplier risks.

Kim and Vonortas (2014) conducted empirical research on young enterprises in Europe on how they manage risks during their early establishment. Although they do not study risk on NPD, they adapted four main domain usually used in NPD that are technology, operational, financial and market to study young enterprises mitigate and manage risks. In fact they chose risk domain from

Keizera et al. (2002) risk management diagnostic method used in developing new product. The research shows evidence of strategic actions by young enterprises in managing risk. Evidence found that entrepreneurs would extensively use internal risk mitigation strategies in volatile environment especially on managing technological risk and operational risk and form more network.

Based on prior research, the following points shows in Table 1 regarding the effect of risk on NPD performance are further discussed, notably technology, market, organizational and financial risk.

Table 3.1 Type of risks affecting NPD performance

Technology Risk	Market Risk
Not completely understand or predict technology environment	Customer feels uncertain or fearful product don't meet with needs or expectation
Lack of technical capabilities	Customer changing needs
Customer do not fully understand technology brought into new product or service	Potential actions of competitor
	Changing economic and social conditions
Organizational Risk	Financial Risk
Competition among companies on resources	Access to working capitals
Human resource availability	Project goes over budget
Supply chain changes	
Conflict within organization	

3.3.2.1. Technology Risk

Perceived technological risk denotes a firm's inability to completely understand or predict some aspects of technological environment related to NPD projects (Miliken, 1987). The source of technology risk can come either from inside or outside of organization. The higher the complexity and sophistication of technological environment the higher the technology risk is. Firms might not foresee the rise of new technology or predict when technology becomes obsolete (Freeman and Soete, 1997).

Technological risk is either endogenous or exogenous to the firm and can arise from two major sources. First is predictability in which firms cannot predict accurately whether the new innovation can function as it promises. Because of technology cycles, no one can accurately forecast how long a new product will survive, and technological obsolescence may kill a new product or process almost as soon as it has been launched. Second is capability whereby it is often unclear whether firms have adequate NPD capability to successfully launch a new product or can provide prompt and effective after-sales service. Capabilities of a fledgling technology or product are often poorly understood and a dominant design for a new product can take years to emerge. Potential users are uncertain whether the technical standard embodied in the new product will dominate in the future. Also, firms cannot accurately predict the unexpected side effects of the new product. These technological risks pose a serious challenge to NPD success.

When companies are about to engage in the process of NPD, often firms might lack the technical capabilities. There are various means firms might mitigate technological risk. For example, having a technology orientation can help firms acquire new technologies, and apply advanced technology to firms' product development and thus keep up with the technological trends. Knowledge gained from external sources can be valuable means to reduce technological risk. Such knowledge enables firms to determine extant technological directions so that the initiatives of the firms are appropriate given industry trends. Firms might consider finding outside experts also helps to mitigate technical risk. However, that is not the case for small firms due to their constraints and lack of resources. Yap and Souder (1994) recommended that small firms improve their new product success rate by avoiding hiring from outside the organization for the purpose of procuring new technologies. Hiring outside experts is only encouraged when the technological uncertainties are very high and the company has very good reason to proceed with the NPD project. Kim and Vonortas (2014) also found in their empirical study that the higher young companies perceived technology risk, they will likely to extensively engage in networks especially for knowledge-intensive sectors. The study also agree with Yap and Souder [20] that firms will introduce new products or services to the market and by not hiring outside experts but rather set up formal R&D and engineering and technical studies departments to deal with technology risk. Companies with strong technical competence in the NPD team can ensure the success rate of a new product both in small and large companies (Cooper and Kleinschmidt, 1995).

Another aspect of technological risk is when customers do not fully understand the new technology brought into their new product. Customers expect ease of use of new products they purchase, so if it becomes difficult to use, the new product might fail to capture the market. Meyer and Roberts (1986) recommended a strategy to small-technology based firms to adopt only one key growth-sustaining technology and avoid high levels of diversification in developing new product. This strategy may put SMEs in better position by mitigating risk and develop learning curve in core technology, thus better understanding of technology in product or service introduce to customer. In respond to technology risk, Kim and Vonortas (2014) suggested that SMEs need to continuously improve their products frequently by maintaining formal in-house research activities.

SMEs are a heterogeneous population of firms whose characteristics vary according to their environment, their size, their market and a series of other parameters. The OECD (2001) has also used a series of surveys of the European Commission and the IRDAC former Industrial R&D Advisory Committee of the European Commission to classify SMEs according to technological intensity. They identified three groups of SMEs. The first group identified as technology developers which tended to be younger companies predominantly in high-tech sectors with a significant share of them investing more than 20% of their turnover in R&D. Meanwhile second group identified as leading technology users, whose vast majority was created more than 10 years ago, from both manufacturing and services but less often from high-tech sectors. The last group

known as technology users mostly in low-tech sectors with a long history and investing little or nothing of turn over in R&D.

3.3.2.2. Marketing Risk

Marketing risk refers to uncertainty about the types and extent of customer needs that can be satisfied by a particular technology or new product (Moriarty and Kosnik, 1989). Much of the existing research evidence suggests that failure of NPD may largely be due to improper marketing. Market risk is high when consumers have had little consumption experience with a product, thus making product requirements difficult to define. Unlike technology risk, market risk is external to firms (Park, 2010), and it is the least controllable risk factor in NPD (Kim and Vonortas, 2014).

The causes of market risk can be numerous. First is customer perceived risk in which customers feel uncertain or fearful and doubt whether a new product can meet their needs and expectations (Meyerowitz and Chaiken, 1987). The second is changing needs of customers. Customers' needs may change according to the latest trend and their lack of understanding of a new product in the market. The third is predicting; it is becoming difficult for firms to forecast and predict potential sales volume of new products (Ogawa and Piller, 2006). The prediction of future revenue and possible profit depends not only on forecasting the total quantity that can be sold, but also on forecasting future costs of production, prices and price elasticity. Market competition volatility makes NPD success more unpredictable. Potential moves made by competitors might pose a threat and risk to small firms.

Market risk still can be managed although it seems difficult and complex. A better and more precise understanding of customers' needs and behavior has been proven to lead to success in NPD. Studies have found that timely and reliable knowledge about customer preferences and requirements is among the most important types of information for product development (Cooper and Kleinschmidt, 1995). According to Ledwith (2000), a strong correlation between market certainty and new product success was found for the small firms, suggesting that external factors had a substantial impact on the outcomes of projects. The study also affirmed the need of small firms to pay close attention to their customers' needs. Yap and Sounder [20] suggest that small firms with resource constraints position their product in low market uncertainty and low technical uncertainty conditions. This positioning strategy allows customers to evaluate the product much more quickly and easily.

3.3.2.3. Organizational Risk

Organizational risk refers to the state of uncertainties in which firms deal with the internal and external environment. It can directly affect NPD performance. Mu *et al.* (2009) discussed this in their study on the effect of direct environmental risk on firms' NPD performance. They elaborate upon three direct effects of environmental factors, namely complexity, munificence and dynamism, which are drawn from Aldrich's (2008) work. Due to a volatile marketplace, heightened competition among companies contributes to environmental complexity. This can cause organizational risk to increase because it is difficult for companies to implement strategic actions against competitors. Limitations on resources also can become a hindrance for firms in

beginning NPD projects. It then will increase uncertainties and risk before companies decide to compete for the scarce resources (Anderson and Tushman, 2001). One way of reducing this kind of risk is by integrating a firm's capabilities into the environment, their business strategy and organizational process. Another way is by utilizing existing networks. Firms can learn best practices and share knowledge and capabilities since external networks have been regarded as important factors in enhancing innovation (Ahuja, 2000).

The management of internal and external relations in new product development is in fact one area where there is a difference in the existing literature on small and large firms. Most of what is published about large firms deals with internal relations. It is discussed that integration between different functional departments will achieve better results both in the characteristics of the products developed and the time taken to develop them (Shrivastava and Souder, 1987; Wheelwright and Clark, 1992). Literature dealing with small firms, however, focuses on external relations, addressing issues such as industrial services, subcontracting relationships, licensing, networking, and collaborative R&D (Rothwell and Dodgson, 1991; Hoffman et al., 1998).

3.3.2.4. Financial Risk

Financial risk pertains to the difficulty in accessing funding which was placed a close second after market risk on the list of obstacles to company growth in the large. The difficulties of small companies in accessing adequate finance are not unknown. The main cause frequently amounts to the information asymmetries between entrepreneurs and investors. Entrepreneurs tend to know their product or service better. They have a better grasp than outsiders of the

timeline for a completed product and its market variability. Investors also tend to have less technical expertise in the field than do the entrepreneurs. Such information asymmetries result in a “trust gap” which creates communication challenges in the relationship between investors and entrepreneurs. While keeping investors informed about progress in product development and the timeline for return on their investment, entrepreneurs will always be mindful of disclosing too much information that potentially allows others to mishandle. Investors may also question the quality of the information because entrepreneurs have an interest in preserving funding sources and may bias information in a way that benefits them. The trust gap makes initial investment decisions more difficult: it increases the risk of investing in a project with low potential for future returns and therefore raises the cost of capital for investments in innovative companies across the board. Information asymmetries and high failure rates are more pronounced in innovative young firms compared to new businesses in more established fields. This raises the price of external capital for innovative companies over what other new companies would pay. Maintaining strong networks is thus the key for them in order to have easier access to external business funds and has long been recognized as a basic incentive for engaging in strategic alliances.

Due to their relatively small size, SMEs lack adequate financial resources to accommodate their growth. Furthermore in order to invest in new product development, SMEs need capital. SMEs are viewed by the current literature as being highly dependent on external financing, and a loan is usually the main source of financing available. This, however, involves the risk that interest rates

on the loans may change over the time. It is very difficult for SMEs to secure funding, especially when banking and private financial institutions do not trust in their capability to pay back the loans. If they have a strong financial position, high chances or probability credit are offered (Kim and Vonortas, 2014). A strong financial position can, at least partially will compensate for high-risk tolerance. Moreover, SMEs with limited collateral are unlikely to be given a loan, regardless of their willingness to take risks, whereas for companies with high collateral, the likelihood of being granted a loan is significantly higher when their willingness to take risks is low. It is suggested that strong collateral cannot compensate for the negative aspects of high risk-taking (Bruns and Fletcher, 2008).

Access to working capital is always one of the major challenges faced by SME, and it is classified as one of the risk domains (Jerrard et al., 2007). Previous work by the authors Jerrard and Barnes (2008) suggested that risk around NPD for design-based entrepreneurs was dominated by both financial risk and risk of reputation. However, the results from continuous study suggest that this may not always be the case; financial risk is limited to the promotion and selling process and how the product is viewed in competitive markets.

Another major concern in this risk domain is that once the new product has been developed, there might be a risk that the project will go over budget. The fact that SMEs have limited financial resources means that they should be more cautious when working on forecasting the budget for any new project (Jerrard and Barnes, 2008).

3.3.3 NPD Performance in SMEs

Successful new products and services are important for many organizations, since product innovation is significant in helping organizations to adapt to changes in markets, technology, and competition. Ensuring optimal new product performance is essential for small firms, particularly in light of the strong relationship between new product success and a company's health (Shepherd and Ahmed, 2000). However, given that the success rate of new products worldwide has been low, increasing understanding of what drives new product success is critical. Griffin and Page (1996) in a study measures new product success into three categories; customer-based success, financial success and technical performance. These categories were used with product development professionals that explored the degree to which different success measures were appropriate in different situations. Based on an examination of 18 different success measures, Griffin and Page (1996) found that the usefulness of measures depended on the project and business strategy adopted and therefore recommended using multidimensional sets of measures for new product success. Huang et al. (2004) based their study investigating the success measures used by Australia SMEs on the measures proposed by Griffin and Page (1996) and found that the most frequently used success measures were customer acceptance, customer satisfaction, meeting performance goals, and meeting quality goals. These measures can be classified as either customer-based or technical. The findings of this study support earlier research that also identified customer acceptance and customer satisfaction as the most commonly used measures of new product success (Griffin and Page, 1996).

Most of the discourse about new product success relates to large companies. One of the most cited studies of product success, done by Cooper and Kleinschmidt (2011), highlighted eight critical drivers of success. One of these is product superiority, in which a new product to be introduced into the market is unique and can be differentiated from those of competitors. He also emphasizes building in the voice of the customer (VoC). New products well perceived by customers will guarantee financial return. On the other hand, their feedback should be heard as early as possible and integrated into the new product development process, from the early stage until product launch, to guarantee success. Many researchers agree that commonly used NPD performance dimensions can be classified as development time, cost and quality. They include the length of development cycles and products first to market, development productivity and financially successful new products, or the proportion of sales from new products (Nicholas et al., 2011; Owens, 2007; Yap and Souder, 1994)

Park (2010) concludes that performance measurements for NPD have two main categories: commercial performance and knowledge-based performance. In the research, one of the clear predictors of the performance of new product development for a company is commercial performance. Fulfilling customers' needs, meeting product specifications, meeting timing goals, meeting market-share goals, meeting unit cost objectives, meeting service goals, meeting productivity goals, creating new markets, and fostering a good reputation are considered commercial performance. Another measurement used to measure NPD performance in the research is knowledge-based performance. This is

when the new product launched is able to lead into the next projects. New product development process activity may also lead to developments in the company's worker skill and capabilities, and therefore lead to more positive outcomes for future development projects. Meanwhile, Mu *et al.* (2009) measured NPD performance using four items: overall NPD process, overall performance of product is satisfactory, product reaches market in a timely manner and cost management of NPD is satisfactory.

The above literature discusses new product performance and success in large companies. A study done by Ledwith (2000) on small electronic firms is more relevant to the current study. The research highlights several factors that contributed to the success of NPD in SMEs. The author agreed that both technical and marketing proficiency in NPD activities are crucial to small and large companies. A large number of studies also reached the same conclusion that speed to market is another factor to ensure NPD success e.g., Cooper (2000). However that is not the case for small companies. For small firms, being first is important but being the best is more important. Although most research indicates that finance is one of the indicators of NPD performance, for small companies it is not of as great interest compared to large companies. This is due to the fact that most small companies have limited financial resources.

Huang *et al.* (2004) found measurement of new product success through their empirical investigation of Australian SMEs in chemical and machinery industries. The research attempted to fill the gaps of whether new product measurement develop for large firms can be applied to SMEs. Results from the research indicated that four commonly use measurement of product success in

SMEs are financial performance, objective market acceptance, subjective market acceptance, and product-level measures. These four measurements are related to each other and can predict overall product success. From the survey, although other factors contribute to new product success, managers believed that customer acceptance and customer satisfaction contributed most to the overall success of a new product.

Based on the above discussion of prior studies, it is clear that four main types of risk affect NPD performance in SMEs, namely technology, market, organizational, and financial risk. The following Figure 1 illustrates a conceptualization of risk determinants. Hence, NPD performance is measured by overall product performance, financial performance, commercial performance and skills and capabilities acquired throughout the process of developing a new product.

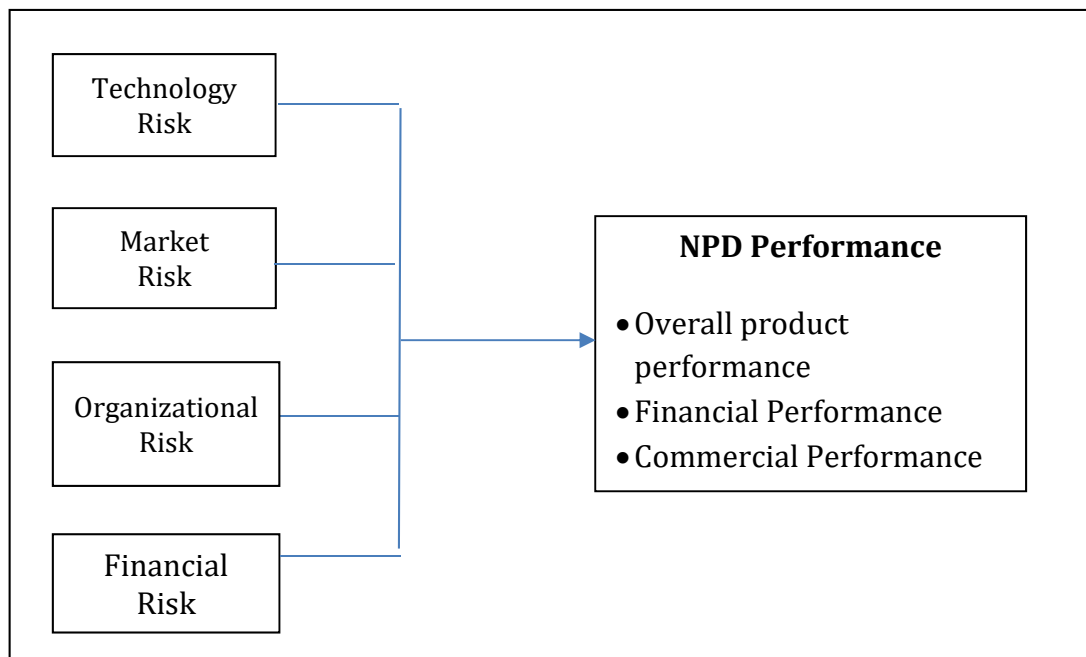


Figure 3.1 Conceptualization of Risk Factors on NPD Performance in SMEs

3.4 CONCLUSION

In order to succeed, SMEs must take risks to launch new products speedily and successfully. Therefore there is a need to take strategic action to mitigate and avoid risks through risk management when developing new products. It is therefore vital for SMEs to have the ability to assess, diagnose and manage risk in the NPD process. Thus, this exploratory study examined the existing literature and identified four main categories of risks which affect new product development performance: technology, market, organizational and financial risks. According to Hollman and Mohammad-Zadeh (1984), the first step in the risk management process should be carried out continuously and systematically by identifying possible sources of loss, and therefore risks. This research findings will help SMEs to carry out the initial stage of risk management process through risk identification. Further empirical research is expected to examine the effect of risk management on NPD, determine the implications and deploy best practices for SMEs to increase their new product success rate.

CHAPTER 4

PERCEIVENESS OF NEW PRODUCTS

4.1 INTRODUCTION

Environmental problems are now becoming global issue. One of the major industries contributed to environmental problems is automotive industries. Harmful gases released polluted the quality of air and wastes in material production of automobiles contribute a lot towards damaging the environment. Fuel consumption leads to greenhouse gases emission and causing climate changes. This issue is becoming more serious urging global community to take drastic actions before facing great threat to the human survival. If effective measures are not taken early to prevent such effect, sooner or later it will cause irreversible loss and offset to the economic development of a country, even worst it can also cause social instability.

Considering this issue, many manufacturing companies find that by producing environment friendly products will give them chance to make a profit. Added to it consumers start to seek for other options for mode of transportation when the fuel price skyrocket. Sales of vehicles which consume more fuel begin to slip. Production volume are becoming lower, making it more unprofitable. Pressure on environmental issues from the society and tough regulations enforce by the

government, makes automaker to produce more cost effective vehicles and appeal to their customers. However due to high cost of making this type of vehicle companies need to reconsider it because it becomes disadvantages for them. Not only they might have problems with competitor's imitation but also consumer demands.

Because people's standard of living starts to improve, the number of private cars increases and contribute more to damage the environment. Automakers start to innovate to make sure not only they get hold of market share back but also revive themselves from becoming the leading contributor polluting the environment. People are expected vehicles of the future not only fuel efficient but also run cleaner. Major automakers are competing into making environmental friendly vehicles. Hybrid cars are currently placing their position steadily among traditional vehicles.

Sales of this vehicle type are seeing stable increase in the recent years, showing people are becoming more environmental conscious. Engine runs efficiently as well as reduces gas emission into the environment.

On the Malaysia perspective, other than facing challenges on environmental issues, automotive industry also face intensifying business environment. Furthermore, with the realization of Asian Free Trade Area (AFTA) in 2005, Malaysian automakers begin to experience the impact. Due to issues and challenges faced by automotive industry, the situation has force the industries

to penetrate niche market using new technology approach; green technology. Malaysia started to accelerate its economic development as developing country after independence. The people standard of living starts to improve making more people to use private cars. The increase number of automobile means increasing damages to the environment. Under the pressure of government and environmental NGOs, automotive industry tries to seek new opportunity by adopting green technology. However, the issue remains is whether Malaysian consumers are ready to embrace green technology in making buying decision. The fact that Malaysian consumers acceptance of environmental friendly products are still low, hence this study will provide future insight to the industries on consumer level of acceptance on green technology of automobile as desired by consumer.

4.1.1 Consumer Perspective on Green Buying

Several studies on consumer intention to purchase green products found several reasons for their behavior. Result from a research by Wang Ying (2010) points that innovation feature, consumer variables, supporting facilities and services closely related to consumer intention to purchase green car. These three variables, consumer factors contributed as the most important factors compare to the other two variables. From the consumer perspective, it is import for them to have the sense of honor when they own a green car. They also take into account on the income when to consider purchasing green products. The government also should intervene by providing supports to consumers which may as well boost sales for green cars. On the innovation features the research suggested automakers should consider increase investment in vehicle

operability, for example safety and performance to satisfy consumer basic needs. Mainieri et al. (1997) approach consumer buying attitude on products that are environmentally beneficial in their research. Findings of this research resulted consumer attitude related closely with their concern towards the environment.

4.2. HYPOTHESES DEVELOPMENT

Consumers' point of view should be taken into consideration in order to create niche market for green product in automotive industries. Several previous studies have included consumers' preferences on green product. Thurston et al. (2000) develop a framework to identify consumers' preferences in buying green products. Cost, quality and environmental factors were proposed in a model as the main preference before consumers decide to buy green product. Meanwhile, study by Hasrini and Firmanzah (2009) on determining factors that influence consumers' decision to buy green product in Indonesia conclude that consumers' intention to buy green design products depends on their perception on environmental benefits, attainable cost and comparative cost. A research in China, consumer decision to purchase green cars based on several aspects, which include car brand, functional factors, economic income, car design, and sense of honour and among others. It is conducted on macro level involving economic and also social impact (Wang Ying, 2010). This study proposed hypothesized variables relationship as follows based on several proposed variables several literatures:

Hypothesis 1: Environmental benefit has direct effect on consumer intention to buy green technology automobile.

Hypothesis 2: Self-to-benefit has direct effect on consumer intention to buy green technology automobile.

Hypothesis 3: Comparative cost has direct effect on consumer intention to buy green technology automobile.

Hypothesis 4: Attainable cost has direct effect on consumer intention to buy green technology automobile.

4.3. METHODOLOGY

In order to obtain reliable information from the respondents, established and validated scales were selected for data collection. In this study, the survey instrument of intention to buy green technology automobile on the independent variables were adopted from the scales developed by Hasrini and Firmanzah (2009). The questionnaire is divided into four several characteristics of buying product (environment benefit, benefit to self, comparative cost and attainable cost) by private automobiles owners which focusing in Malacca. Based on randomly approach and surveying distribution, only 200 respondents which are selected. Plus, since this study is a short-term grant which refer to very limited time and cost. The respondents were asked to rate each item on a 5-point Likert scale from 1 = strongly disagree to 5 = strongly agree.

4.4. DATA COLLECTION AND ANALYSIS

The questionnaires for this study administered 200 private automobile owners from around Malacca, Malaysia. The owners represent automotive user and

have been a growing population in Malaysia. The respondents completed the survey and were assured anonymity. Participants of this survey consisted of both sexes and of different races. About 196 completed questionnaires were obtained and sufficiently complete to be usable. The majority of the respondents were male (57%) and of Malay ethnicity (79%). Female respondents represent by another 43% of all respondents. Other ethnics, Chinese stands for 9% and Indians for 6% only. Of the 196 respondents, 62% of them were between age 20 and 30, 12% were between age 31 to 40, 5% were between age 41 to 50, 2% were between age 41 to 50 and 17% were younger than age 20.

In terms of their education level, 38% of the respondents graduated with degree. About 41% attended secondary school and finished their SPM/MCE level. Most of the respondents have income between RM1, 001 to RM3, 000 of 57%. Only small number of respondents from high income group which represent 2%. In order to test each hypothesis, correlation analysis is used against dependent variable on four independent variables. Regression test is employed in this study to test the significant of all independent variables on the consumer intention to purchase green technology vehicle.

4.5. RESULTS AND DISCUSSION

From the statistical result, it can be concluded that environmental benefits of green vehicles positively influence customers' intention to buy. The result indicates strong relationship between these two variables. As a result, hypothesis 1 is accepted. Benefit to self does also significantly influence

customers' intention to buy green vehicle, therefore Hypothesis 2 is also accepted. While comparative cost and attainable cost significantly influence customers' intention to buy green products, Hypotheses 3 and 4 are accepted. Regression analysis indicates all four independent variables are significant towards the intention of consumer to purchase green technology vehicle with 87% independent variables effect towards dependent variable. In all the Pearson Correlation test resulted significant relationship of each independent variables with consumer intention to buy green technology vehicle at 0.01 levels. However attainable cost indicates a weaker relationship. Whereas environmental benefits positively influence consumer intention to purchase green car with the strongest relationship ($r_p = 0.695$).

Consumers' attitude towards becoming more environmental friendly reflected in their preference of choice when it comes to their intention to purchase green technology automobile (Mainieri et.al, 1997). It is noteworthy then to conclude in this study environmental benefits towards the consumers highly supported their intention. The other variables not to be ignored; benefit-to-self, comparative cost and attainable cost significantly affect consumer intention to purchase green technology vehicle even though the relationships not too strong.

4.6. CONCLUSION

This paper studies the customers' perception of the value of green technology in automobile based on the intangible benefits and cost. These two factors are selected in order to address the main weaknesses of green products as

described earlier. From this study, it is revealed that customers' intention to buy green car in Malaysia depends on their perception on environmental benefits, benefit-to-self, attainable cost and comparative cost. Therefore, the main market target of green cars in Malaysia is customers with higher degree of environmental concern. Automakers must ensure that environmental benefits are actually achieved at the final products stage. Otherwise, customers will not trust the products offered. If this happens, it is likely that the products will not be successful in the market. Another consideration must be addressed by automakers not only on environmental benefits to the consumer but also price. Consumer may will to spend a lot green technology vehicle because of its benefit, but when automakers put a high price on it, it may change their decision to purchase.

CHAPTER 5

MANAGING NEW PRODUCT DEVELOPMENT (NPD) RISK: COMPARISON BETWEEN JAPAN AND MALAYSIA SMALL MEDIUM ENTERPRISES (SMEs)

5.1 INTRODUCTION

The importance of small medium enterprises (SMEs) is widely recognized to be part of national economic development whether in developed or developing countries and they form the very basis of every country's economy. Their role as an engine in creating job opportunities and contribution to economic growth put them in one of main national economic policy. One of primary success of SMEs to sustain in competitive market and contribute to economic growth is through developing new product, in other word is developing and commercializing innovations. Both SMEs in developed or developing countries are vital for being part of economic growth. Factors that determine SMEs drive to innovate are important in developed economies as well to developing economies (Radas et. al, 2009). This comparative study selected Japan, as developed country and Malaysia as developing country to analyze differences of SMEs responding on managing risk in NPD. Starting point of article will briefly describe categorization of SMEs in each country on the following point.

5.1.1 SMEs in Japan

In Japan the term SME is clearly define in SME Basic Act formed in 1963 and amended on 3rd December 1999. The definition of SMEs is outline further detail in the following table.

Table 1: Categorization of SME in Japan

Industry type	SMEs		Micro Enterprises
	Stated capital	Number of Regular Employees	Number of Regular Employees
Manufacturing	Up to¥ 300m	300 or fewer	20 or fewer
Wholesale	Up to ¥100m	100 or fewer	5 or fewer
Service industry	Up to ¥50m	100 or fewer	5 or fewer
Retail	Up to ¥50m	50 or fewer	5 or fewer

Source: *METI, Japan*

Japan SMEs are the backbone of Japanese economy. Back in 1996 the number of SMEs in the non-primary sector in Japan stood at 6.6 million and SMEs had 44 million employees. To put these numbers in perspective, SMEs accounted for 98.8 percent of total number of firms and they employed 77.6 percent of total employees. The 2012 Economic Census for Business Activity by METI, SMEs made up to 99.7% of all enterprises in Japan and forms the very basis of Japanese economy. Approximately 87% or 3.34 million are micro businesses out of 3.864 million SMEs in Japan (METI, 2012). Despite stagnant and volatile economic conditions, SMEs in Japan still survive and stay resilient for the past

two decades. One of their success factors is due to its numerical dominance, which in total accounted for 4.2 million. By international standard Japan has a relatively large number of SMEs per capita, compared to other developed countries. They play a part in revitalizing local economies and boosting employment opportunities. They created employment demand thus maintaining low employment rates that provide stability forces for Japan economy (Shimizu, 2013). SMEs alone provide employment to 11.92 million workers, which account about 26% job employment to workforce. A document publishes by Japan Small Business Research Institute (JBSRI) under Ministry of Economy, Trade and Industry (METI) of Japan called 'white paper' reports comprehensively on SMEs annually. It is reported that SMEs contributed approximately ¥519 trillion of sales in 2015 made up almost half of contribution by large businesses. Even the contributions from SMEs look promising to economic development, however it does come with challenges. Japan is currently having aging and shrinking population thus making local market shrink as well. Another challenge highlighted in 2014 White Paper is on aging of micro business proprietors. Nevertheless the government has taken proactive actions to overcome this issue (JBSRI, 2014).

5.1.2 SMEs in Malaysia

Since 2005, a common definition for SMEs endorsed by the National SME Development Council (NSDC) has been adopted across Ministries and agencies, financial institutions and regulators involved in SME development programs. The definition is divided into two main categories. The first is manufacturing (including agro-based) and manufacturing-related services with sales turnover

of less than RM25 million or full-time employees of less than 150. The second category is manufacturing (including agro-based) and manufacturing-related services: sales turnover of less than RM25 million or full-time employees of less than 150. A new SME definition was endorsed at the 14th NSDC Meeting in July 2013 given that there have been many developments in the economy since 2005 such as price inflation, structural changes and change in business trends, a review of the definition was undertaken in 2013. The newly revised definition of Malaysia SMEs is outline in the following table.

Table 2: Categorization of SMEs in Malaysia

Sector	Enterprise Size		
	Micro	Small	Medium
Manufacturing (including manufacturing related services and Agro based industries)	Sales turnover <RM300, 000 OR Full time employees less than 5	RM300, 000 < Sales turnover <RM15m OR full time employees between 5 and 75	RM15m < Sales turnover <RM50m OR full time employees between 7 and 200
Services, Primary agriculture and ICT	Sales turnover less than RM300, 000 OR Full time employees less than 5	Sales turnover between RM200, 000 and less than RM15m OR full time employees between 5 and 30	Sales turnover between RM3m and less than RM20m OR full time employees between 30 and 75

Source: *SME Corp Malaysia*

In 2011 an Economic Census Report by Department of Statistics Malaysia reported that SMEs accounted for about 645,136 companies or 97.3% out of

662,939 overall total establishments (Department of Statistics Malaysia, 2011). Concentration of SMEs establishments comes from service sector accounted for 90% and most are microenterprises which forming about 77% of total SMEs. In 2014, indicates contribution of SMEs to overall GDP (gross domestic product) has increased to 35.9% an increase by 33.5% from previous year. Albeit challenging year ahead due to global economic turbulence, Malaysia SMEs are expected to continue to expand their GDP contribution by 5% to 5.5%. When the definition of SME changed in 2014 it has put about 8,000 large firms into medium enterprises category. A strong performance of economic sectors came from service and construction sector contributed the most to SMEs share in GDP. An annual report published by SME Corp Malaysia in 2014 highlight challenges and obstacles in SMEs sector. SMEs still lack of access to finance especially from financial institutions until now. Even though credit conditions have relaxed they still have difficulty to access funding through banking institutions. SMEs are encouraged to explore other alternative sources of finance without depending on government to ensure a sustainable growth. Even though credit conditions had become more relaxed, bank lending to SMEs are still difficult to access. Another issue has been a concern it is found that most SMEs don't have business continuity planning. Lack of awareness for intellectual property (IP) adoption is also another concern. SMEs perceive the process of getting IP can be cumbersome and take a long time to get approves, thus making them not to acquire IP. Large businesses take the opportunity to snatch ideas from SMEs, which can be devastated to them as a lot of resources being put to innovate and develop new product or services (SME Annual Report, 2015).

5.2. THEORETICAL BACKGROUND AND LITERATURE REVIEW

NPD is a process in which ideas or technologies are materialized, managed, and finally moved to market. Technology, organization, and marketing are the three most indispensable NPD process components (Mu et.al, 2009). When developing a new product, risk management should be integrated into development process. Risk may occur in any stage of NPD. The objectives of risks management are to minimize the negative impacts and maximize the positive impacts for new product development while corresponding to the organization's management system (Park, 2010). The goal of the risk management is to establish the feasibility of the project within the organizational management structure, technology level, human resource capability, financial situation, and within the production and marketing level that limit its own business. By identifying main sources of risk, NPD can be more manageable. Thus adapting three sources of risk namely, operational, technology and marketing the following points will elaborate more on this (Mu et. al, 2009).

5.2·1 Operational Risk

Operational risk involves firms dealing within internal operation and management or organization. The source of operational risk comes from diverse sources. One of main sources of operational risk is human resource availability. In NPD limitation of employees with adequate skills and knowledge also can

become a hindrance for firms in beginning of NPD projects. It then will increase uncertainties and risk before companies decide to compete for the scarce resources such in obtaining skill and knowledge worker in relating area. One way of reducing this kind of risk is by integrating a firm's capabilities into the environment, their business strategy and organizational process. Another way is by utilizing existing networks. Firms can learn best practices and share knowledge and capabilities since external networks have been regarded as important factors in enhancing innovation (Kim and Vonortas, 2014).

5.2.2 Technological Risk

Perceived technological risk means a firm's inability to completely understand or predict some aspects of technological environment related to NPD projects. The source of technology risk can comes either form inside or outside of organization. The higher the complexity and sophistication of technological environment the higher the technology risk is. Firms might not foresee the rise of new technology or predict when technology becomes obsolete.

Another identified technological risk is capability. When companies are about to engage in the process of NPD, often firms might lack the technical capabilities. Therefore in order to mitigate technical risk, firms might consider finding outside experts. However, that is not the case for small firms due to their constraints and lack of resources. Instead small firms improve their new product success rate by avoiding hiring from outside the organization for the purpose of procuring new technologies. Hiring outside experts is only encouraged when the technological uncertainties are very high and the

company has very good reason to proceed with the NPD project (Yap and Souder, 1994). A study also found that the higher young companies perceived technology risk, they will likely to extensively engage in networks especially for knowledge-intensive sectors (Kim and Vonortas, 2014). The study also agree that firms will introduce new products or services to the market and by not hiring outside experts but rather set up formal R&D and engineering and technical studies departments to deal with technology risk. Companies with strong technical competence in the NPD team can ensure the success rate of a new product both in small and large companies (Kim and Vonortas, 2014).

It is empirically proven that technology oriented adoption can reduce uncertainties and risk in NPD process. Together with customer and technology orientation strategy, it will create dynamism that can lead to achieving far more superior performance in uncertain market (Gatignon and Xuereb, 1997). It is also recommended to small-technology based firms to adopt only one key growth-sustaining technology and avoid high levels of diversification in developing new product. This strategy may put SMEs in better position by mitigating risk and develop learning curve in core technology, thus better understanding of technology in product or service introduce to customer (Meyer and Roberts, 1986).

5.2.3 Marketing Risk

Market risk refers to uncertainty about the types and extent of customer needs that can be satisfied by a particular technology or new product (Ogawa and Piller, 2006). Much of the existing research evidence suggests that failure of

NPD may largely be due to improper marketing. Market risk is high when consumers have had little consumption experience with a product, thus making product requirements difficult to define. Unlike technology risk, market risk is external to firms, and it is the least controllable risk factor in NPD (Park, 2010; Kim and Vonortas, 2014).

The causes of market risk can be numerous. First is customer perceived risk in which customers feel uncertain or fearful and doubt whether a new product can meet their needs and expectations. The second is changing needs of customers. Customer's needs may change according to the latest trend and their lack of understanding of a new product in the market. The third is predicting; it is becoming difficult for firms to forecast and predict potential sales volume of new products (Ogawa and Piller, 2006). The prediction of future revenue and possible profit depends not only on forecasting the total quantity that can be sold, but also on forecasting future costs of production, prices and price elasticity. Market competition volatility makes NPD success more unpredictable. Potential moves made by competitors might pose a threat and risk to small firms.

Market risk still can be managed although it seems difficult and complex. A better and more precise understanding of customer' needs and behavior has been proven to lead to success in NPD. Studies have found that timely and reliable knowledge about customer preferences and requirements is among the most important types of information for product development (Cooper and Kleinschmidt, 1995). A strong correlation between market certainty and new

product success was found for the small firms, suggesting that external factors had a substantial impact on the outcomes of projects. The study also affirmed the need of small firms to pay close attention to their customer' needs (Nicholas et. al, 2011).

5.3. METHODOLOGY

To carry out this study, researchers adopted questionnaire data collection method that found to be most suitable to reach the study's objectives. A set of structured questionnaire is constructed through three identified variables. Three identified dependent variables mentioned before operational, technology, marketing risk with each items are developed to represent each variables. In total about 16 items are placed in the questionnaire. Respondents were required to rate each items based on multiple choices given. Once the questionnaire completely developed we conducted pilot test to check the reliability of the questionnaire. The questionnaire was given to two academicians for reviewing who are expert in questionnaire development. In the end minor changes were made by eliminating unnecessary items and reworded while retaining its original meaning.

5.3.1 Sampling and Data Collection

Samples are selected in industrialize zone in each country. In Malaysia, SMEs from central area Selangor is selected. According to 2011 Economic Census, most SMEs establishments are located in Selangor that represents about 19% of all SMEs establishments and has about 125,904 (Department of Statistics

Malaysia, 2011). Meanwhile in Japan, the city of Nagoya is selected to distribute survey, as it is the third largest incorporated city in Japan that house many renowned manufacturers. The one of the main criteria chosen are, each SME's company at least has to have experience in developing new product thus have the ability and capacity to answer the survey given. Questionnaires are distributed in two types of method. One is using conventional method by mailing out survey form and respondents expected to return to us. The second method is using online survey form which is much more convenient. Targeted respondent are being called upon and requested to participate in our study. If the respondent agrees to participate we will then email the respondent link of our online survey form.

5.4. ANALYSIS AND RESULTS

Within four months period of data collection yielding about 90 return questionnaires. About 45 surveys from Malaysia and 45 surveys from Japan managed to be collected and analyzed. In total, the return rate is more than that consider acceptable to be analyzed. The data are analyzed using descriptive analysis. Descriptive analysis refers to the transformation to describe a set of factors that will make them easy to understand and interpret. This study is expected to shed some light on how SMEs in both countries manage risk in NPD process. Data were collected on demographic variables are processed and reported in percentage through the descriptive analysis. Another test is also conducted to figure whether there is a difference in NPD performance between Japan and Malaysia SMEs. The test is McNemar's test that assesses the

significance of the difference between two correlated proportions. It is used to determine if there are differences on a dichotomous dependent variable between two related groups, in this case NPD performance of Japan and Malaysia SMEs.

5.4·1 Operational Risk

5.4.1.1 Product Development Team

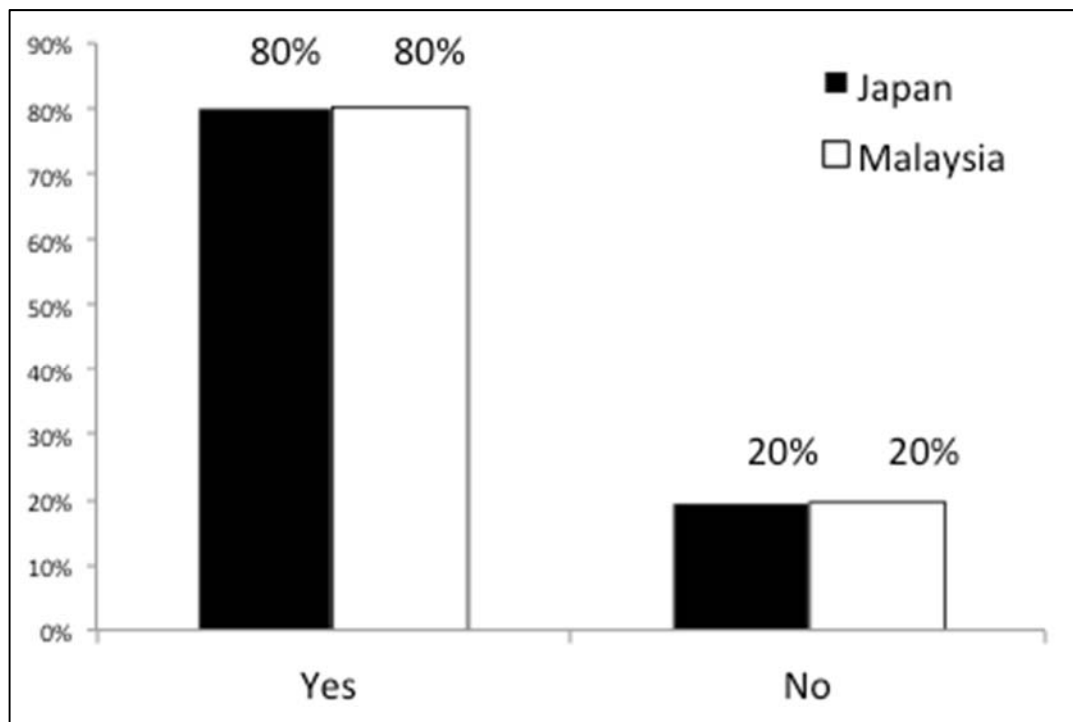


Figure 5.1: Product Development Team

As shown in Figure 5.1, both countries have the same respond in having product development team made up about 80% of all respondents. Only 20% in both are not having product development team. However, part of 80% of having product development team in both, Japan has 25% informal team whereas Malaysia only

15%. This shows that Japan slightly prefer to have informal team as long as they reach their company's objective. Perhaps the likelihood behind formation of informal team is the need to accelerate new product process. Informal team allows decision making and flow of information can be made much quicker between different functional group. It is also consistent with findings in a study found significant correlation of organizational structure with project success (Yap and Souder, 1994). Specifically, high volume information flows through diverse interdepartmental integration found to eliminate conflict, engender cooperation, and foster new product commercial success. Moreover informal team creates flexibility by enabling the team to move forward without being tied to structure and existing bureaucratic system compared to formal team. Nonetheless whether it is formal or informal team formed in the company helps to accelerate new product process but rather early commitment and involvement of various functional groups in new product development may assists to reduce risk in later stage (Owens, 2007). Furthermore, strong technical competence in NPD team also proved contributes to success rate both in small and large firms (Cooper and Kleinschmidt, 1995).

5.4.1.2 Experts Advice on NPD

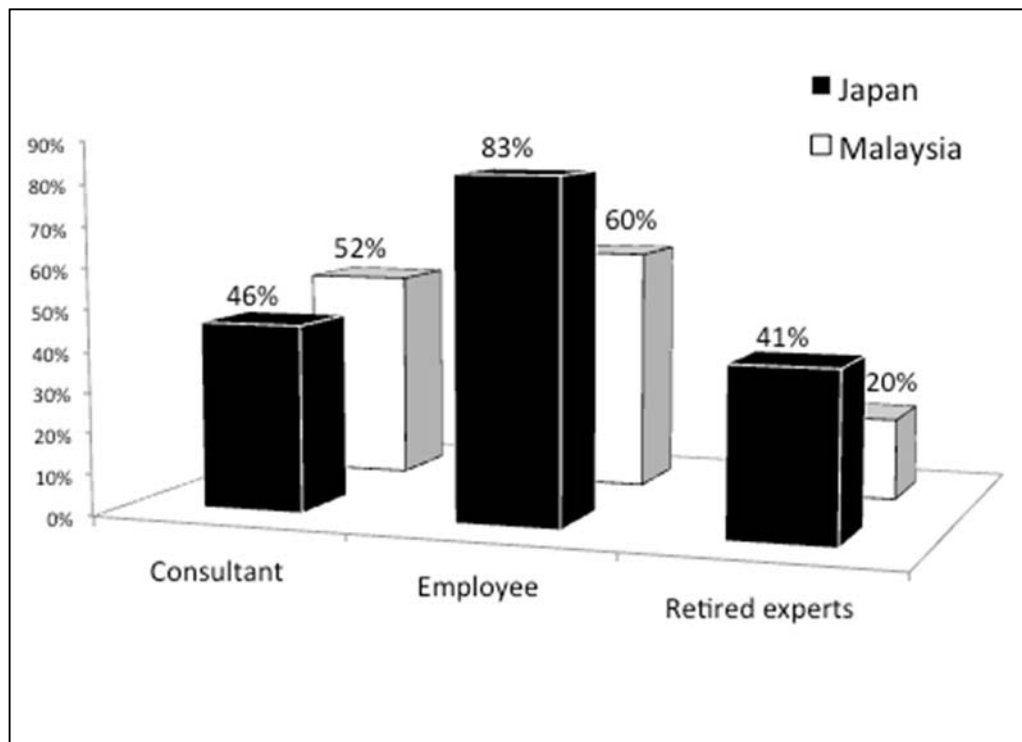


Figure 5.2: Taking advice on NPD

Part of reducing risk and uncertainties in NPD process is by seeking advices from several sources. From the survey, most SMEs in Japan chose employee suggestion to improve their NPD process. But they also seek expertise by using consultant and advice from retired experts shown in Figure 5.2. In Malaysia, suggestion from employee also regarded as most valuable and does not require a lot of cost compare hiring outside consultant. Unlike their counterpart Japan, Malaysia SMEs are less unlikely to seek advice from retired experts.

Relating to percentage in hiring consultant, more than half companies opted for this for both countries. It is rather confound that SMEs in both countries hired

consultant considering the nature of SMEs lacking in resources. Unless acquiring needed technology in NPD is high technical uncertainty, and the benefits outweigh organizational disruption then hiring outside experts is recommended (Yap and Souder, 1994).

Both countries chose suggestion from employees the most in improving product development process. Most well-known continuous system originated from Japan called Kaizen involving employees to contribute suggestions for ongoing improvement in product development process as well. Starting from small ideas and improvements that can be implemented immediately. This process in a way will reduce risk during the NPD process.

Shifting analysis on getting retiree experts in NPD process, Japan are more likely to choose this source compare to Malaysia. As Japanese employees are highly experienced, skilled and knowledgeable, thus making employer reluctant to let them leave even after retiring from the company. As most experienced workers have tacit knowledge, the risk of losing them may cause non-monetary loss the company (Gilmore et. al, 2004). Malaysia SMEs on the other hand still facing lack of skilled and talented workers, which affects the quality of production as well as efficiency and productivity, which reflects in the graph on hiring retired experts (Saleh and Ndubisi, 2006).

5.4.2 Technology Risk

5.4.2.1 IT Adoption

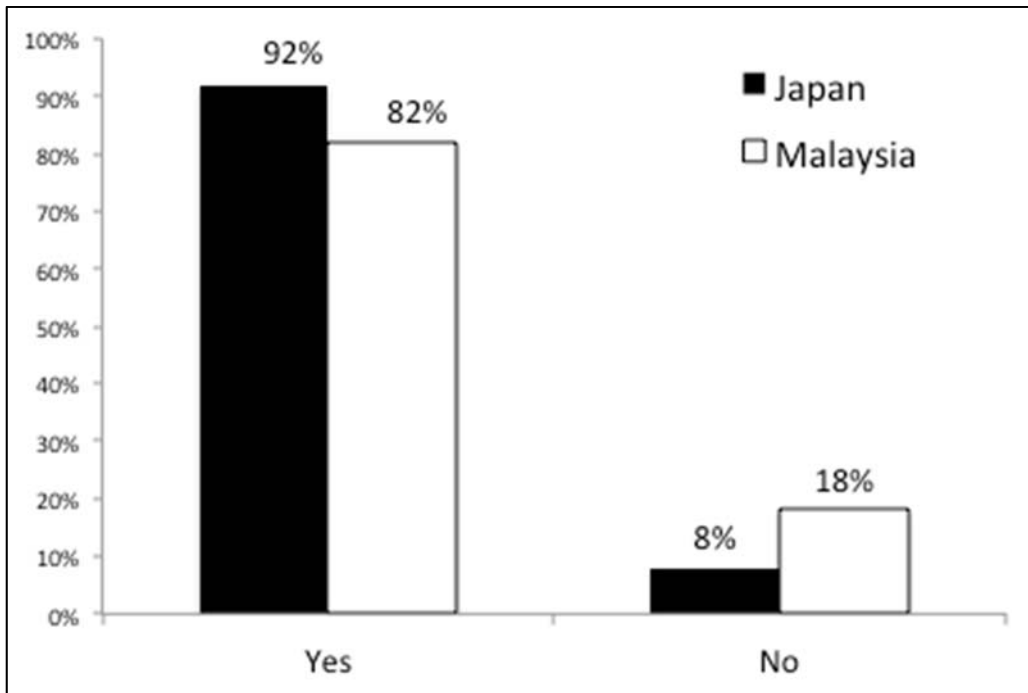


Figure 5. 3: Use of IT

Both respondents from Japan and Malaysia agreed that using information technology (IT) in their NPD process reduces risk with both represent 92% and 82% respectively shows in Figure 5.3. In Japan, high level of IT adoption is an evidence of government success in implementation of policy to promote the diffusion of IT among Japanese businesses. In year 2000, the Japan government implemented strategy to reverse stagnant economy. In December 2000, the Basic Law on the Formation of an “Advanced Information and Telecommunications Network Society” was enacted and in January 2001, an “IT Strategy Headquarters” was established in the public sector and then an “e-Japan Strategy” was announced. A large-scale study involving 6,432 SMEs from various sector conducted in Japan to analyze the relationship between both IT

and innovative activities in Japan, as well as the relationship between IT and profitability, and the impact of firm size on both productivity and firm performance (Morikawa, 2004). The study found that the use of computers by Japanese SMEs has a positive relationship with innovative activity with evidence found that firms whose use IT to be more likely to engage in R&D activity. The study thus supported high adoption of IT among Japan SMEs and implying the achievement of government approach on encouraging IT diffusion.

However not all SMEs agree upon using technology to minimize risk particularly in NPD process. Relatively only small percentage of respondents did not agree. Comparatively 18% of Malaysia SMEs seems did not agree on the adoption of IT, which higher than Japan up to 10%. This finding coherent with a study on the major reason of lower rate IT adoption among SMEs in Malaysia. It was due to sense of lacking in security despite the cyber laws available to protect the business environment (Sin Tan et. al, 2009). The SMEs either have no confidence or have no idea of their existence in view of their indifference in the uncertainties of ICT law. Most SMEs perceived the barriers of implementing IT into their business operations as rather expensive, risky, complex procedure and lack of technical expertise. This lead to their ignorance on the usefulness of technology identified as a factor leading to lower rate of technology adoption. Most Malaysia SMEs perceived the barriers of implementing IT into their business operations as expensive, risky, complex procedure and lack of technical expertise(Alam and Mohd Kamal, 2009). Another research also highlighted one of the fundamental problems among SMEs in Malaysia were low adoption of modern technology (Ong et. al, 2010).

5.4.2.2 ISO and Guidelines Adoption

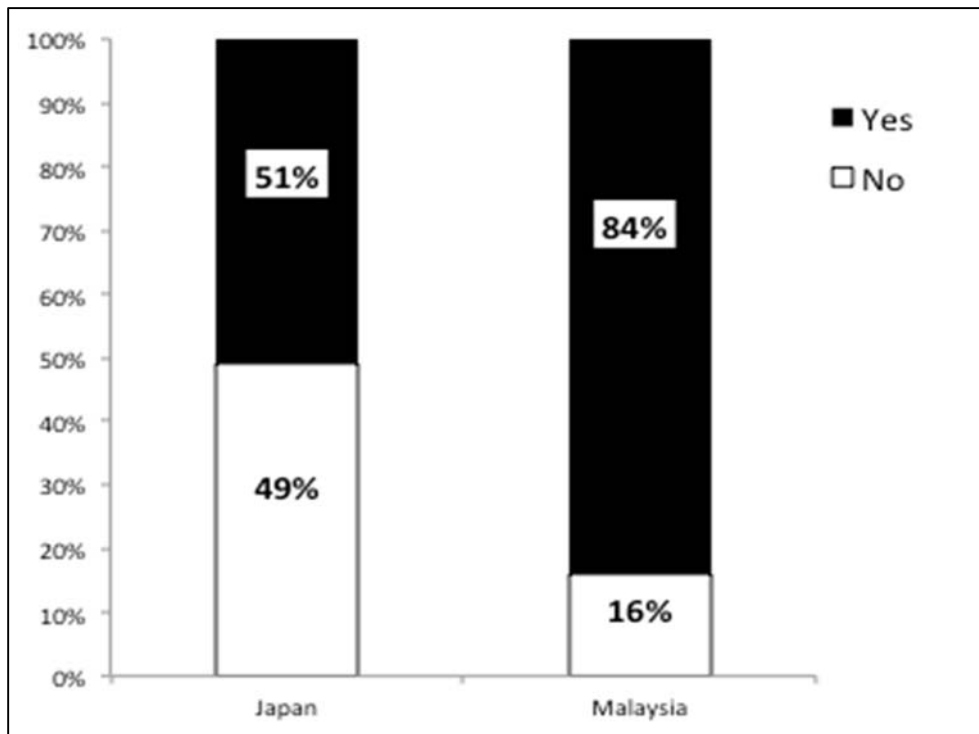


Figure 5.4: ISO/Guideline adoption

From Figure 5.4, there is a vast difference in adoption of whether ISO or Standard guidelines. In Japan approximately more than half of the respondents adopted ISO, and another half didn't, which represent 51% and 49% separately. One of the underlying factors of low adoption in Standard is because perhaps Japan SMEs practice their own existing standards without even getting certification. Supporting this outcome probably because of the existing nature of business environment in Japan. SMEs act as subcontractor for large enterprises especially in manufacturing industry. And most small Japanese firms favorable towards working as subcontractor to large firms (Kimura, 2002). SMEs therefore will follow guidelines and standards established by large firms in order to maintain quality.

Malaysia SMEs on the other hand mostly adopted ISO that represents 84%, and only 16% didn't adopt ISO guidelines. Malaysia SMEs believe that by adopting ISO guideline it will contribute more advantage and credential to their customers especially when they gained certification. In 2003 a conducted research on Malaysia SMEs discovered that there are significant differences in performances between certified and non-certified firms, supporting the hypothesis that ISO 9000 certification contributes to a higher organizational performance (Sadiq and Hoong, 2003).

5.4.3 Marketing Risk

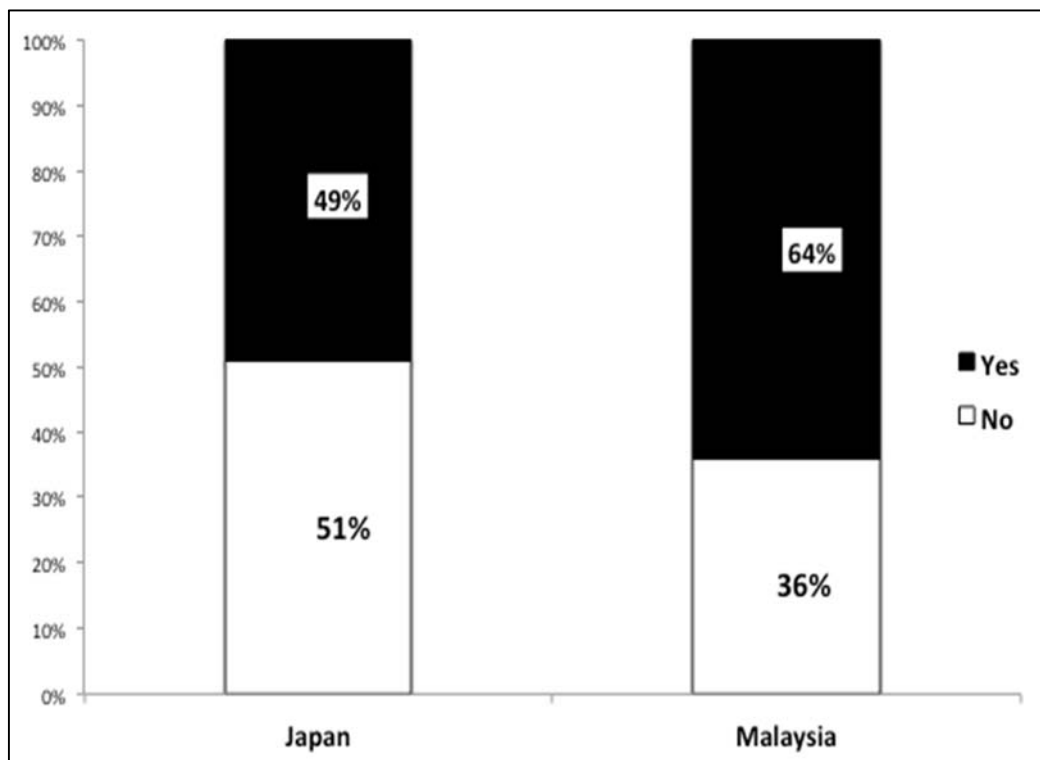


Figure 5.5: Usage of Customer Relationship Tools

Marketing risk in NPD is consider complex but still can be managed. In order to success in NPD, firms need to have accurate understanding of customer

behavior and choosing appropriate marketing strategies that can be attained through customer relationship tools. However, surprisingly, findings from this study found that only 49%, not more than half of Japanese SMEs utilize customer relationship tools to reduce risk in NPD process. This yet should not come to a surprise, as most SMEs in general do not have the resources to explore their own markets. Instead, the Japanese SMEs depend heavily on their trading partners for marketing of their products, within the framework of local production networks and subcontracting relationships (Itoh and Urata, 1994).

Almost 36% of Malaysia SMEs didn't use customer relationship tools to assist them in gaining knowledge about customer preferences and requirements. Another 64% did use it to help them retain their customers. The option to adopt Customer Relationship Management (CRM) tools maybe influenced by management characteristics (Nguyen et. al, 2013). SMEs reluctant to invest in such tools, as they believe it don't provide benefits. Some SMEs have experienced high failure rates when it comes to CRM adoption, as it is not easy to integrate this business philosophy into everyday business.

5.4.4 Type of risk

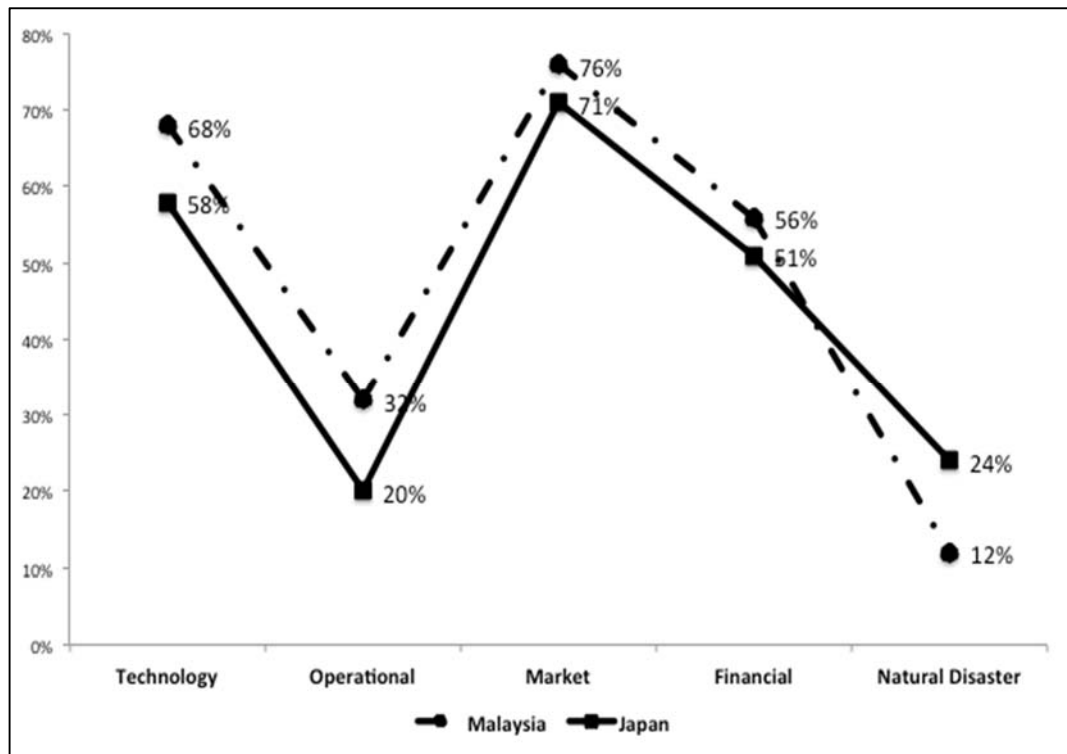


Figure 5.6: Types of Risk

Referring to Figure 5.6, SMEs in both countries have the same pattern in identifying risk in their company. Mostly perceived marketing risk as their major concern. Looking at the proportion, both concern on marketing risk 71% and 76% for Japan and Malaysia SMEs. This is understandable since market risk is external to company it's beyond their control. Furthermore market risk is the least controllable risk factor in NPD. There are three main sources of market risk in NPD, customer perceived risk, changing need of customer and forecasting the market (Mu et. al, 2009).

5.4.5 NPD Performance

McNemar's test is conducted to observe whether there is difference in NPD performance in both countries. Because of small sample and dichotomous scale for this item, McNemar's test is the most appropriate test to be used. Assumption is made there is no difference in both NPD performance of each country. A two-tail t-test is selected because the variance is not known and whether to accept or reject the following hypothesis null.

$$H_0 : p_J - p_M = 0$$

$$H_1 : p_J - p_M \neq 0$$

Outcome of the test is presented in Table 5.1.

Table 5.1: McNemar's Test for NPD Performance

	Japan	Malaysia
Mean	0.4667	0.8222
Variance	0.2545	0.1495
Observations	45.0000	45.0000
df	82.0000	
t Stat	-3.7523	
P(T<=t) two-tail	0.0003**	
t Critical two-tail	1.9893	

** Tested significant at 95 percent level of confidence

Result found in Table 5.1 shows that t value of -3.7523 is way outside the value of $-t_{\text{Critical}}$. Therefore we reject hypothesis null. The conclusion then there is significant difference between NPD performance in Japan and Malaysia

5.5. CONCLUSION

Managing risk in business activity no matter how big or small the business is, should not be taken lightly. Failure to manage risk is something should not be compromise. Looking at the result discussed in previous points, we can conclude that SMEs in both countries practices on managing risks are almost the same. The only dissimilarity is adoption of standardization. Government involvement and policies established play important roles in choosing standardization strategy. From the preceding analyses, several conclusions can be drawn. It is true that SMEs are lack in resources that impede their development. To focus their efforts alone in managing risk in NPD will cost too much for them, either financially or operationally. However instead of putting their effort alone in managing risk in NPD they could integrate managing risk in their existing system. Further study is recommended to develop right measure in handling risk for SMEs.

CHAPTER 6

CONCLUSIONS

This dissertation is mainly divided into three main objectives. The first objective is achieved through investigation on trend and evolvement of risk management before and after the introduction of ISO 31000: 2009. It is thoroughly discussed in Chapter 2. One of the contributions of this research is through methodology used in simplifying high-density text documents into scatter plot that visualize patterns. R program has help in achieving the analytical process. The initial step is compilation of high-density text documents using text-mining approach. Text-mining techniques useful to uncover useful information buried in high volume text documents. To analyze the text documents, the next step is using MeCab and RMeCab applications in R Program to run the correspondence analysis. Critical advantage of using correspondence analysis in this research is the fact that it's capability to analyze data table in which observations are described by several inter-correlated quantitative dependent variables. The analysis presents the proportion structure of elements in the columns and rows of a contingency table in the form of points in a space with lower dimensionality. To turn the output from correspondence analysis into graphical form, the data then calculated using canonical analysis then eventually formed intersection points for axis-X and axis-Y. Final output of this method produced scatter plot to illustrate trend and progression of risk management.

It can be deduced in from the graph that risk management has long existed before the introduction of risk management standard. However, it is very diverse across different industries. Even for publics according to the Society for Risk Analysis Japan, they rarely discuss about risk and there is lack of dialogue concerning risk in Japan. After the Great East Japan Earthquake, active move has been made to close the gap of understanding on risk started. Proactive communication and actions about risks are carry out by different agencies to levitate understanding on risks issues. Different industries perhaps have different understanding on risk based on their sector. But when it comes to risk, whether from public or private sector there is a need to build a bridge to connect mutual and coherent understanding in risk communication.

In Chapter 3 further explores the implication and effect of risk management on business perspective. The scope is then limited towards SMEs or otherwise it will be too much information to be covered. Systematic reviewing is used to screen through academic publications coverage on risk management. It has been found that a lot of articles mostly covered risk management in SMEs in too much wider scope. This method used has given more focus of search to achieve one of research objectives. The final output of in this chapter found three types of risk to significantly affect SMEs especially during NPD projects. It

Chapter 4 mainly discusses the investigation of risk affect on NPD project. Using four risk factors identified, the study found significant effects of risk on the performance of NPD.

In Chapter 5, a comparative study done between Japan and Malaysia SMEs on the implication and effect of risk management. One of the significant findings in the analysis is on approach of standard adoption to manage risks. The adoption perhaps depends on business culture in each country. Japanese SMEs believed that ISO standards are not necessary because the existing standards are already sufficient to their performance. Unlike their counterpart in Malaysia, ISO Standards are used for marketing purposes. They believed that certification of ISO will gain customer's confidence in using their products or services. But overall both countries SMEs perceived risk as important and manage risk in the same manner.

In conclusion this research has obtained three main objectives through different unique approaches. After for more than seven years of being introduced, this research offers glimpse on the impact of ISO 31000: 2009 introduction one of developed country. The findings as well provide useful insights for SMEs when it comes to manage risk and facilitate in their decision making.

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LIST OF PUBLICATIONS

Journal

- 1) *(Review in progress)*
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- 2) *(Reviewed and to be published)*
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