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Risk Response Strategies in the Supply Chain: Examining Attributes of Stakeholders and Risk Attitude

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By

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Abstract

Supply chain management is about managing flows of material, information and funds in a complex network of entities of suppliers, manufacturers, distributors and customers. Companies are now connected in this network as an extended enterprise and any company may be involved in more than one such extended enterprises. But, such a network of relationships is very much vulnerable to disruptions of all sorts ranging from internal to inter-firm and to external turbulences. Companies now need to be prepared for risks associated with their participation in the supply chain network. Not many works in the literature have used theories to study supply chain risk management (SCRM). Only a handful of papers can be found to have used theories but even these authors confined to only studying supply risks. In this thesis, we aim to study both supply and demand risks due to suppliers and customers of a focal firm. As suppliers and customers have been recognized to be stakeholders with respect to the focal firm, we propose to use 'stakeholder theory' to investigate the question of how stakeholder attributes influence the decision made by managers on the choice of the risk response strategies. We also plan to explore the moderating effect of risk attitudes of the managers on the risk response decisions. Using data provided by managers from over 200 Singapore firms, we found support for some of the attributes relationships among risk attitude and partial relationships among risk attitude, stakeholder attributes, and risk response strategies. Factor analysis identified two groups of risk response strategies: process and buffer oriented risk response strategies. By examining the attributes contributing to manager's decision to pursue either one or both of the risk response strategies, this study has important implications to firms in managing their stakeholders.

Table of Contents

Acknowledgment

This thesis arose in part out of almost 2 years of research that has been done since I came to Singapore Management University (SMU). By that time, I have worked with a great number of people whose contribution in assorted ways to the research and the making of the thesis deserved special mention. It is a pleasure to convey my gratitude to them in all my humble acknowledgement.

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all of them, my sincere wish for everyone a successful career in the academics or industry. Most importantly, do well in life.

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1 Introduction

1.1 Description of the problem to be studied

There is little doubt that risk, or at least our perception of risk, is becoming more prevalent in almost every dimension of our lives. Not only do we perceive and sense greater increased likelihood, greater exposure and more severe consequences, we have also become more aware of risks previously unknown to us. As with individuals, firms are continuously receiving information inputs suggesting new risks, increased exposure to existing risks and escalating costs associated with compensation should such risk materialized. A recent study of the views of 500 financial executives in America and Europe concluded that they perceived an increase in overall business risks in the near or foreseeable future, with supply chain related risks featuring as one of the top three risks alongside property and competition related risks. Several authors (Smallman 1996; Giannakis et al. 2004) have identified the emergence of risk management especially risk mitigation strategies as an important contributor to most fields of management decision and control, including Supply Chain Risk Management (SCRM). According to the researchers, supply chain risk management is defined as "the field of activity seeking to eliminate, reduce and generally control pure risks" (Waring and Glendon 1998, p. 3). Other studies defined it as "the identification and management of risks for the supply chain, through a coordinated approach amongst supply chain members, to reduce supply chain vulnerability as a whole".

The literature has also highlighted the importance of risk mitigation strategies in achieving a competitive advantage (Wagner 2008) and creating values (Hallikas 2008). Many firms have implemented supply chain risk mitigation strategies in their business operations (Dani 2008; Wagner 2008). However, our understanding of what enables or influences risk mitigation strategies is still very limited. Although marketing researchers have studied factors that influence

firms' marketing strategies from the perspective of stakeholder attributes (Knox 2007), this perspective has not been applied to SCRM strategies.

Our premise in this thesis is that stakeholder attributes influence risk response strategies. Accordingly, we propose to use stakeholder theory to find the relationship between stakeholder attributes and risk response strategies in supply chain context. We also propose to study the role of risk attitude of the managers as a moderator to the relationship.

1.2 Rationale and justification for the study

Information revolution and globalization have brought supply chain management to the center stage of research. Supply chain management is the activity of managing flows of material, information and funds in a complex network of suppliers, customers and manufacturers. Many firms are now embedded in this network of enterprises and any firm maybe involved in more than one such extended enterprise. This network of enterprises has proven to be mutually beneficial and cost effective to all collaborative partners. However, such a network of extended enterprises is extremely vulnerable to disruptions. The disruptions range from internal to external turbulences, generally called risks.

The risks[1] may be classified as internal to the supply chain network and external to the network. The risks that may arise internally in the network, but not limited to, are supply and demand risks. Supply risk is related to potential or actual disturbances to the flow of product and/or information emanating from the supplier and demand risk relates to the potential disturbance to the flow of product to customer and/or information between the firm and demand market. Examples of risks

[1] Risks in supply chain involve probabilistic measures of the occurrences of particular with an associated measure of the consequences of these events (The Royal Society 1992). The quantitative definition of supply chain risks can thus be expressed as Supply Chain Risk=Probability (of an event) x Business Impact (or severity) of the event.

external to the supply chain network are Sept 11, health epidemic, currency fluctuations and socio-political events. In the business environment that followed the September 11th attacks, managers became increasingly aware of the potential damage that can be caused by these catastrophic events. This awareness is reinforced over the past years by highly publicized events such as the two major hurricanes that came ashore in the Gulf Coast region during the summer of 2005 and the East Coast blackout two years before (Knemeyer et al. 2009). Moreover, with shorter product life cycles (Johonson 2001) and pressures from competitors to be the first to reach the market, firms need to be proactive in mitigating the risks associated with supply chains. Companies can no longer afford to wait for the events to happen and react to those issues after they occur. They need to have a well developed and structured plan in hand for managing these risks.

One can also note that firms are, generally, aware of risk management[2] and the need to incorporate contingency planning and risk management to manage the risks but these are mainly confined to financial risks. As mentioned above, there is now a growing awareness to manage risks to supply chains too. Therefore, supply chain risk management is emerging as a critical area of research due to its importance for the supply chain members. This awareness prompted many recent researchers (Svennson 2002; Johnson 2001; Zsidisin et al 2003) to advocate a structured approach to managing supply chain risks. A closer look into the literature reveals three streams of research in this area. These are conceptual, empirical and mathematical (Lee 1993). However, the mathematical stream is not the focus of our research.

[2] As a result of high profile and publicized events as described above by Knemeyer et al (2009), the issue of risk management is receiving greater attention by supply chain researchers and practitioners (Spekman and Davis 2004).

Most of the works were mainly conceptual drawing lessons from other areas like finance and project management. They include works from Juttner et al (2003) and Ritchie (2008). Juttner et al (2003) who deplored that firms who thought that they have managed risk have often overlooked the critical exposures along their supply chains. They proposed a research model with several basic constructs such as risk sources, adverse supply chain risk consequences, supply chain drivers and supply chain risk mitigating strategies for the SCRM conceptual model (Figure 1). From the model, they concluded that supply chain vulnerability is the propensity of risk sources and risk drivers to outweigh risk mitigating strategies, thus causing adverse supply chain risk consequences.

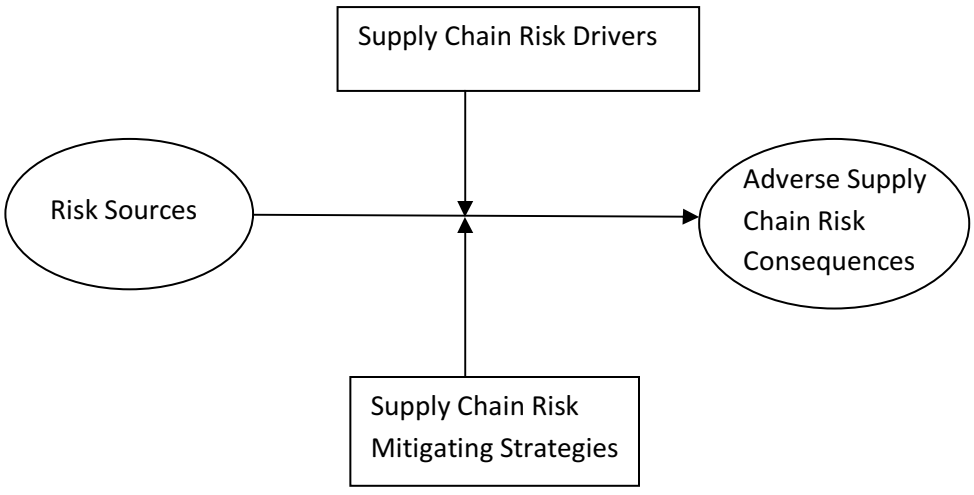

Figure 1. Supply Chain Risk Management conceptual model

The research on supply chain risk management is not limited to conceptual models alone. There are also many empirical studies that have being carried out in this area. The empirical studies can

in turn be divided into two categories. They are non-theory-based and theory-based. Some notable works among others in the non theory-based empirical works are Juttner (2005) and Wagner (2008). Juttner (2005) studied on business requirements for supply chain risk management from a practitioner perspective and explored the contemporary practice in SCRM. Specifically, the empirical studies were mostly designed to find out how well supply chain risks were recognized and the then prevailing state of practice in SCRM. Wagner's (2008) empirical study examined the relevance of various supply chain risks and the implementation of supply chain risk management ideas in practice. Building on a comprehensive examination of the various supply chain risk taxonomies and risk management practices, Wagner used a large scale questionnaire survey to empirically investigated SCRM. His study reinforced the notion that supply and demand coordination is the central and important issue in supply chain risk management.

Besides the above stream of research, one can also find theory-based empirical works in the area of SCRM. But these are not many. As far as our knowledge goes, there are only a couple of papers[3]. The first paper by Zsidisin & Ellram (2003) used Agency Theory to examine supply risks. Taking the focal firm to be the principal and the suppliers to be the agents, they looked at various supply risk sources and investigated whether behavior or buffer based risk management is suitable to reduce information asymmetries between the principal and agent. Behavior based and buffer based management are two types of management commonly employed among the manufacturing firms. The behavior based management focus on processes, emphasizing tasks

[3] When additional literature review is done before the conclusion of this thesis, it is found that Cantor & Macdonald (2009), though not directly related to risk management in supply chain, draw on construal level theory from the experimental psychology literature to explain how the problem solving approaches such as abstract problem solving approaches and concrete problem solving approach can contribute to supply chain performance. A series of behavioral experiments are conducted to test our hypotheses. The key finding is that individuals who take an abstract problem solving approach perform better than those who take a concrete problem solving approach in the context of limited information availability. Refer to the paper for more information.

and activities that lead to a reduction in supply risk. The buffer based management is simply increase inventory as a buffer for product unavailability. They found that the more prevalent the supply risk sources were, the more likely that behavior-based risk management was implemented. This is in line with the underlying assumption of agency theory. Continuing on their earlier work, Zsidisin et al. (2005) used Institutional Theory to study how and why firms create business continuity plans to manage supply risks. Based on the case studies, they identified a set of propositions on how various isomorphic pressures result in firms having similar risk management practices embedded in their supply management practices over time.

Further literature review reveals that stakeholder theory is also used to study supply chain collaboration (Henry & Frank 2009). They used stakeholder theory to study how prior dyadic relations with a stakeholder and perceptions of situational demands on the relationship determine the choice of aggressive strategies vs cooperative strategies in managing stakeholder relationships. Based on their findings, they manage to identify two groups of stakeholder strategies which are the aggressive and cooperative strategies. Models were developed for these two types of stakeholder management strategies. When the level of thrust among stakeholders is low, a firm that wants to complete the collaboration activity may choose aggressive strategies in dealing with its trading partners. Cooperative strategies will only be adopted when it is perceived that its trading partners share the urgency to collaborate and benefits flowing from the collaboration activity.

From the foregoing, it is very clear that there are not many theory-based empirical researches in the literature. But it is well known that theories can shed significant light on supply chain risk management and help resolve ongoing debates while opening up new areas for investigation (Ketchen 2004). Susan (1998) also strongly supports the use of theory in operation management

research. Motivated by these observations, we embarked on using theory based empirical research in SCRM.

Further, even the couple of theory-based researches on SCRM were confined to only supply side risks. As highlighted before, the field of SCRM encompasses many risks. Hence, we decided to extend the literature by including demand side risks in our study.

Having decided on the above mode of study, we then surveyed the strategic management literature area for appropriate theory to use for studying both demand and supply risks. These risks are confined to risks arising from supplier and customers who can be identified as stakeholders, we narrowed our search into theories pertaining to stakeholder management. We found that in the literature, Frooman's (1999) seminal paper on resource dependency theory in stakeholder management was cited alongside Mitchell's (1997) work. However, Frooman (1999) views the firm and stakeholders from an 'outside-in' perspective - the development of influencing strategies among the firm and stakeholders. Mitchell's stakeholder theory adopts an 'inside-out' perspective. This view fits better in our research protocol since in our study the manager is the focal point in managing the supplier and the customer. Thus, the unit of analysis in our work is the manager, probably the one at the top management who decides on the strategies to manage the suppliers and/or customer.

The choice of stakeholder theory in our study may lead to readers in an illusion that we are doing the same study as Henry & Frank's (2009) stakeholder theory in supply chain collaboration. However, it is important and essential that our stakeholder theory adopts an 'inside-out' perspective (Frooman 1999). Whereas, Henry & Frank basically views the firm and its variety of stakeholders from an 'outside-in' perspective- the development of aggressive and cooperative

strategies among the firm and stakeholders. It could be said that our study does not substitute Henry & Frank's paper but could act as a complement and towards a wealthier literature of stakeholder theory in the field of supply chain.

We point out that supply chain risk management is akin to project management. In project management, managing the stakeholder forms an important part of Project Risk Management. We point out that in choosing stakeholder theory in our research we were inspired by similar applications of stakeholder theory for project risk management (Bourne & Walker, 2006).

It is often assumed in supply chain risk management research that firms make strategic decision. Often, in reality, it is the person at the top management level who decides what direction the firm should take. Since manager[4] is not a robot, human factors play a major part in his or her decision. Therefore, in this study, we decide to investigate the role of risk attitude of manager in the choice of SCRM strategies. A review of the literature in this direction revealed that managerial characteristics are moderators in stakeholder management (Mitchell 1997). For example, managers vary greatly in their environmental scanning practices (Daft, Sormunen. & Parks 1998) and in their values (Hambrick & Mason 1984). Differences in managerial values are illustrative of the moderating effects of management characteristics (Frederick, 1995). Risk attitude, being one of the managerial characteristics, has not been studied in SCRM. We believe that greater insights can be gleaned by incorporating risk attitude of managers as a moderating factor in our study as the risk attitude of a decision maker has a definite impact on risk management decisions (Manuj 2008).

[4] It should be noted that manager being an employee of a firm makes the decision are human, and human decision-making is "bounded" in its ability to acquire and process information. Human tend to apply simplifying heuristics to deal with complex problems (Simon 1997).

1.3 Significance of the study

The study would be innovative in the sense that our research will be a fusion of two independent, important and contemporary field of work, namely strategic management and supply chain risk management. The integration of these two broad literatures also presents an opportunity to close a research gap in the understanding of managers' decision making in supply chain. Thus, this study is also new to SCRM as no other study[5] has used stakeholder theory and the risk attitude of managers in this area.

Furthermore, it well known that logistics and supply chain management is one of the pillars of Singapore's economy. A report on logistics and supply chain activities in Singapore reported that this sector has contributed to about 8 percent of Singapore's GDP and continues to provide employment to more than 70,000 people (Enterprise One 2007). Therefore, this study will also be significant to the Singapore's supply chain sector as we propose to survey the managers in Singapore firms.

1.4 Specific aims or objectives

In this thesis, we propose to investigate the question of how the stakeholder attributes influence the decision on supply chain risk response strategies chosen by managers based on stakeholder theory. As a firm can have many stakeholders in collaboration, we limit our study to two main stakeholders: suppliers and customers because of the time and budget constraints pertaining to the Master of Science program. Specifically, our objectives are:

[5] At the point of concluding the whole thesis, it is found that a similar study has appeared with the choice of stakeholder theory in supply chain collaboration (Henry and Frank 2009) when additional literature review is done. However, there exists subtle difference in the approach as mentioned in section 1.2 above which is worth distinguishing.

1. To identify supply chain risk response strategies practiced in Singapore.
2. To propose and empirically test a model that explains the relationship between stakeholder attributes and supply chain risk response strategies.
3. To investigate managers risk attitude and its moderating effects on the choice of risk response strategies.

In all, it is our hope that this paper presents an important first step in framing this topic conceptually and empirically by providing substantive empirical results, and in presenting an especially appropriate methodological approach to conduct research on this topic. This thesis is organized into seven sections. Section 2 presents relevant and selected literature from both supply chain risk management and stakeholder theory. Section 3 presents our conceptual framework with three main hypotheses positing our model. Section 4 describes the experimental method and methodology in detail and Section 5 presents the statistical analysis result. These results and their implications are considered in Section 6. Section 7 concludes this paper.

2 Literature Review

2.1 Defining risk in supply chain

The word "risk[6]" is derived from the early Italian word *risicare*, which means to dare (Bernstein 1996). As time passed by, its meaning has evolved and changed. It also appears to mean different things to different people depending on their individual perception of the events happening (Frosdick 1997). In the seventeenth century, French mathematicians Pascal and Fermat studied and applied risk in gambling. Their work led to the development of probability theory which is the heart of the concept of risk (Bernstein 1996). In the early nineteenth century, the term risk had been adopted by the insurance industry in England (Moore 1983). However, it was only in the 1950s, with major developments in technology and expanding size of organizations, that risk and its management became of concern to the wider business community[7] (Snider 1991).

In today's business world a supply chain may be stretched out across the world in order to provide the customer with the product at the lowest cost and the highest quality. Zsidisin (2003) suggested that supply risk in a supply chain context can be defined as the potential occurrence of an incidence associated with inbound supply in which the result is the inability of the firm to meet customer demand. There is considerable evidence that failure to manage supply chain risk effectively can have a significant negative impact on firms (Mitchell 1995). The importance of supply chain risks cannot be underestimated. The failure to manage supply chain risks can lead to a sharp downturn in a firm's share price, which can be slow to recover (Hendricks and Singhal 2005). There are also wider consequences of a failure to manage risks such as financial losses, reduction in product quality, loss of reputation and others (Cousins et al. 2004). As the foregoing

[6] Risk is also defined by the Royal Society 'as the probability that a particular adverse event occurs during a stated period of time, or results from a particular challenge.

[7] It should be noted that the importance of risk to decision making in the business community is attested by its position in decision theory, by its grounding in managerial ideology (Peters and Waterman 1982), and by the burgeoning interest in risk assessment and management (Crouch and Wilson 1982).

examination of the literature shows, approaches to managing risks are required and this has evidently led to the researchers focus on supply chain risk management[8].

A review of the literature reveals many categorizations of risks in supply chain. Deloach (2000) three dimensions: external, internal and information risk. Supply chain risk has also been classified into strategic, financial, operational, commercial and technical risks (Hiles and Barnes 2001).Christopher and Peck (2003) have categorized supply chain risk as: process, control, demand, supply and environmental. Rao and Goldsby (2009) acknowledged the growing literature but lacked an organized structure for the sources of supply chain risk. They bridge the gap by synthesizing the diverse literature into a typology of risk sources, consisting of environmental, industry, organizational, problem-specific and decision-making factors. We subscribe to Christopher and Peck (2003) classification of supply chain risk due to its popularity and holistic. Due to time constraint of this study, we have decided to concentrate only supply and demand risk in this thesis.

Supply risks relates to the potential or actual disturbances to the flow of product, information and cash emanating from the upstream of the focal firm. It is also the possibility of occurrence of an event associated with inbound supply, such that the outcome results in the inability of the focal firm to meet customer demand and other requirements (Zsidisin et al. 2004). As supply risks are commonly prevalent, we decided to include supply risks arising out of suppliers in our study.

Demand risk is the possibility of an event associated with outbound flows. Sources of demand risk could be delayed new product information, variations in demand and movement of goods

[8] The risk of disruptions caused by factors in supply chains is one of the main concerns of both academia and practitioners (Trkman and McCormack 2009). Supply chain risk management is therefore an area of increasing and escalating importance and is aimed at developing approaches to the identification, assessment, analysis and treatment of areas of vulnerability. There are many trends that enhance exposure to risks, such as the reduction of the supplier base, globalisation and outsourcing and shorter product life cycles (Norrman and Jansson 2004).

from the focal firm to the customers (Manuj 2008). Most of the studies in SCRM focus only on supply risk but it is our view that demand side risks are also important as such incidents have the potential to turn away the customer. Hence, in our study, we will focus on demand risks also.

Having identified the types of risk to cover in this thesis, we will now briefly review the literature on supply chain risk management.

2.2 Overview of Supply Chain Risk Management

Efficient supply chain risk management can provide value to various stakeholders of a firm. For example, compliance with appropriate risk management procedures and policies can help to reduce or avoid crisis situations. SCRM entails identifying risks and developing mitigation procedures to maintain operational performance (Dani 2008). It has also been receiving much attention now than in the previous decade due to events like the threat of international terrorism (Sheffi, 2002) and other global events. The literature in supply chain risk management is vast[9] in the sense of quantity. However, today, there exists no generally agreed definition of SCRM. It can be defined as the "field of activity seeking to eliminate, reduce and generally control pure risks" (Waring and Glendon 1998, p. 3). Lindroth and Norman (2001), however, took a more restricted approach. They stated that SCRM dealt with risks caused by, or impacting on, logistics-related activities or resources. Later, Juttner (2005) defined SCRM as a managerial activity involving the identification and management of risks for the supply chain, through a co-ordinated approach amongst supply chain members, to reduce supply chain vulnerability as a whole. While the terminology can differ among the authors, a systematic SCRM process usually comprises of the following stages: (1) risk identification, (2) risk analysis, (3) risk mitigation

[9] Refer to Ulf Paulsson's Chapter 6 "Supply Chain Risk Management" in Clare Brindley's Supply Chain Risk. Paulsson has done a detailed research in the literature of supply chain risk management. Though the research area of supply chain risk management appears to be a fairly new area, it is found that the number of articles is clearly increasing during the period of 1995-2003.

strategies and (4) risk monitoring (Mullai 2008). The overall objective of this SCRM process is to determine, implement and monitor an optimal mix of measures to avoid, defer, reduce, or transfer all relevant risks. This is a proactive approach to responding to risks unlike the traditional reactive approach.

However, our aim in this study is to learn about the managerial activity of identifying specific risk response strategies, which is the third step in the SCRM response process mentioned above.

2.3 Risk response strategies

There is a large body of literature proposing supply chain risk response strategies (e.g., Choi and Liker 1995; Christopher and Peck 2004; Mullai 2004; Elkins et al. 2005). The proposed risk response strategies can be differentiated or classified according to various criteria.

Elkins et al. (2005) based on their interview of executives in the U.S, developed a list of 18 best supply chain risk response strategies that firms can implement in their business operations. These are based on the findings on initiatives that firms had in place or were working towards it in the year of study. Some of these strategies are screen potential suppliers for risks, train key employees to improve real-time decision making capabilities and conduct teleconferences with critical suppliers. Mullai (2004) developed a detailed taxonomy of risk mitigation strategies and categorized them as avoidance, reduction, transfer and acceptance. This is similar to what is practiced in other areas like project management and so are generic in nature.

The most cited categorization in the literature is the one provided by Choi and Liker (1995). According to the authors, the risks fall broadly into two categories: process-oriented and buffer-oriented. Process-oriented risk response strategies focus on processes rather than outcomes (Anderson and Oliver 1987). Managers who use process-oriented risk response strategies avoid

the occurrence of events by focusing at its causes. For instance, frequent contact with suppliers reduces the risk of inaccurate assessment of supplier abilities (Christopher 2005). Flexible pricing strategy which is a process-oriented risk response strategy helps firm's product prices to better align with demand from customer (Christopher 2008). Certification of suppliers is also part of a process oriented risk response strategies (Lockhart and Ettkin 1993). On the other hand, the buffer oriented risk response strategies are an outcome based approach (Choi & Liker 1995). Instead of focusing on the process and reduce the likelihood and impact of a detrimental event, firms normally employ buffers (Zsidisin et al. 2003) like for example holding inventories. Inventory often serves as a buffer for product unavailability. Designing products with longer life is another example of buffer-oriented strategy. The use of multiple suppliers for an item also serves as a buffer (Tullous & Utecht 1992).

The classification[10] as process and buffer oriented risk response strategies to business philosophy is not new and cannot be underestimated. For example, Ishikawa (1985) advanced the process and buffer strategies idea into the management of quality. He argued that one often thinks of quality as a trait inherent in the final product, but it is important to think of quality in the process en route to the final creation of that quality product. Imai (1986) similarly contrasted the different implications of process oriented and buffer oriented thinking in business management. He illustrated that when evaluating sales people, process oriented manager focused on the process based aspects of sales (e.g., the amount of time spent calling on new customers).

[10] The classifications of process and buffer represent two distinct conceptions of value dichotomy (Choi and Liker 1995). Process orientation focuses on people's doing things appropriately in a normatively acceptable way, independent of the availability of clearly rationalized connections to the desirable end state of existence. Buffer (sometimes known as result orientation), on the other hand, focuses on their rationalization of the steps required to obtain a strategic goal. It assumes a rational connection between the actions and the intended end state.

However, a manager who used buffer based thinking tended to consider the total number of final sales – the bottom line.

Recently, Wagner & Bode (2008) differentiated between process and buffer oriented risk management practices in a firm's operation. Thus, this classification which started in quality management has withstood the test of time

A closer reading of the literature reveals that many authors have been more prescriptive in their recommendations and tend to advocate more process oriented risk response strategies (Choi & Liker 1995). For instance, Imai (1986) attributed the success of business operations to process oriented strategies. He further pointed out that buffer oriented strategies are probably a remnant of the past mass production legacy. Process oriented strategies are more suited for the postindustrial and high tech society.

From the discussion above, we note that process-oriented strategies are proactive in responding to risks while buffer-oriented strategies are defensive in nature. But, we also infer that a proper mix of these strategies is what makes firm to click. In view of the above, we propose to use this classification in our study also.

A list of the strategies under these categories which are chosen for this study is summarized in Figure 2. It should be noted that the list is no exhaustive and there may be other strategies in use. Our study will attempt to identify these too.

2.4 Recognizing Stakeholders of a focal firm

Interest in knowing and managing stakeholders of a firm has been the subject of research for quite long. For example, in the early 80s, Jones (1980) posed the following questions: "What are

these stakeholder groups? How many of these groups must be served? Which of their interests are most important?" These questions are still being explored in stakeholder literature. For instance, Alkhafaji (1989) defined stakeholders as groups to whom the firm is responsible.

Process-Oriented Risk Response Strategies	**Definition**	**References**
Frequent contact with suppliers	Meeting up with supplier to discuss critical issues	Christopher (2005)
Certification of suppliers	Identifying suppliers' abilities to meet quality, cost, service and delivery requirements	Lockhart and Ettkin (1993)
Requirement to the supplier for a business continuity plan	Detailed disruption awareness plan describing supplier's efforts risk management capabilities that can be executed	Debra (2005)
Flexible pricing strategy	Rapidly adjusting the price of products to better match demand to the available supply	Christopher (2008)
Identify correct number of channels	Identify avenues available for displaying of products	Johonson (2001)
Buffer-Oriented Risk Response Strategies		
Safety stock	Additional stock or items for products, supporting activities	Lee and Bellington (1993); Newman, Hanna and Maffei (1993)
Using multiple supply sources	Procument of a good or service from more than one independent source	Tullous and Utecht (1992)
Build longer life product through variety strategies	Building on familiarity, extensions of the current product	Johonson (2001)

Figure 2. A summary of process and buffer oriented risk response strategies

Thompson et al. (1991) defined stakeholders as groups in relationship with an organization. Scholars have attempted to specify a more comprehensive stakeholder definition, though with limited success. This is because various academic disciplines have advanced several versions of stakeholder theory (Roberts and Mahoney 2004).

Similar to the above, there exist many definitions for the term 'stakeholder'. Freeman's (1984) classic definition of stakeholder has withstood the test of time. He defined a stakeholder to be any group or individual who can affect or is affected by the firm's objectives. This is definitely

one of the broadest definitions of a stakeholder in the literature, for it leaves the field of possible stakeholders to include virtually anyone. For example, a firm will have suppliers, customers, interest groups, employees and others as stakeholders. As mentioned above, our study will only consider the suppliers and the customers.

This leads us to the next question: How do actions of the stakeholders affect the firm? In the supply chain context, we recognize that some supply and demand risks arise out of supplier and customer actions which can affect the focal firm. The supply risks that can arise out of suppliers are suppliers being technologically behind competitors (Robertson & Gtignon 1998), uncompetitive pricing (Tang 1999), inability to meet quality requirement (Zsidisin et al. 2000) and possible supplier bankruptcy (Zsidisin & Ritchie 2008).Therefore, firms or managers are constantly involved in responding to these risks so as to receive the right supplies at the right time in right quantity and in the right place.

On the other hand, demand risks can arise out of customer actions and can affect the focal firm. Uncertainty in demand requirement (Kopczak & Lee 1993) and bad payment behavior or payment default of customers (Wagner and Bode 2008) are some of the demand risks that can arise. Owing to these, managers are again compelled to respond to these risks in their efforts to get the right product to the right customers.

Thus, today's managers have to constantly be dealing with their suppliers and customers, understand them and their requirements and objectives and then put in place adequate policies and/or measures to meet the challenges. As suppliers and customers form part of the stakeholder[11] group of the firm, we propose to study the study the choice of supply chain risk

[11] It should be noted that suppliers and customers are not the only stakeholders of a focal firm. For example, terrorists group can be an important stakeholder to an oil firm (Sheffi 2002).

response strategies from the perspective of stakeholder theory. We now provide a brief literature review on stakeholder theory.

2.5 Overview of Stakeholder Theory

The stakeholder[12] approach and the recognition of stakeholders in organizational studies and in strategic management in particular are influenced by the landmark book, Strategic Management: A Stakeholder Approach by Freeman (1984). As clearly expressed in the book, the central purpose of stakeholder theory[13] has been to enable managers to understand stakeholders and strategically manage them. The responsibility of a firm is to take into account the different views and interests of any group or individual who can affect or is affected by the achievement of the firm's purpose (Freeman 1984). Freeman, therefore, presented the stakeholder model as a map in which the firm is at the hub of a wheel and stakeholders are at the ends of spokes around the wheel (Figure 3). This conceptualization has become the convention from which stakeholder theory has developed.

[12] It should be noted that there are three distinguishing characteristics of stakeholder research in the area. First, there is stakeholder research which focuses primarily on dyadic ties between a stakeholder and the focal firm – as in our case between the firm and its suppliers, the firm and its customers. It could also be firm and its employees Rowley 1997). Second, stakeholder research takes the perspective that stakeholder groups put claims and demands or even pressures on the firm, forcing the firm to placate in a response to stakeholders. There exists an adversarial and dependency relationship. Lastly, stakeholder research focuses on issues related to public policy such as ethical. normative aspects and social responsibility (Bunn 2002).

[13] The stakeholder theory has been presented within the framework of management theories. As a result, many theories including stakeholder theory are in a jungle as described by Koontz (1980). This is especially so for stakeholder theory as it is still greatly debated by management scientists about its direction and application. However, it does not deter us from using stakeholder theory as the basis for our research as it has been widely applied in other fields such as marketing and not-for-profit organization.

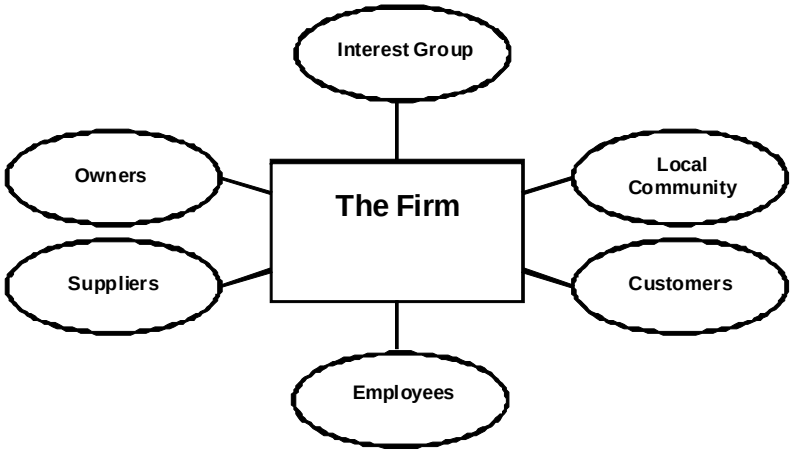

Figure 3. Freeman's Stakeholder model

Clarkson (1995) was of the opinion that the modern firm is affected by a large set of forces[14]. At its minimum, the forces include the stockholders, customers, suppliers and employees who are named as primary stakeholders. The characteristics of these primary stakeholders are vital to the survival and success of the firm. He enlarged, however, the list of stakeholders to include other possible forces such as the local community, media, courts, government and interest groups and society, which are named as secondary stakeholders. These secondary stakeholders are not as influential as primary stakeholders but still have the potential to affect the firm (Clarkson 1995).

Donaldson and Preston (1995) best framed much of the recent discussion on stakeholder theory. According to them, stakeholder theory is different from other theories of the firm in fundamental ways. It views the firm as the focal point through which numerous and diverse stakeholders participate and accomplish multiple purposes. It is intended to explain and guide the structure and operation of a firm. The typology of their stakeholder theory as being descriptive, instrumental or normative in nature, is an important contribution towards clarifying the dual

[14] It should be noted that other than Clarkson (1995) primary and secondary stakeholder classification, stakeholders can include both internal and external stakeholders. Internal stakeholders encompass employees and managers. External stakeholders include customers, government regulators, shareholders and society in general (Sakris et al 2010).

purposes intended which are to explain and to guide the operation of any firm. Descriptive aspect of stakeholder theory is employed to describe and sometimes to explain specific organizational characteristics and behavior; the nature of the firm and the way managers think. It reflects and explains past, present and future states of affairs of firms and their stakeholders. Instrumental stakeholder theory identifies connection between stakeholder theory and the achievement of corporate objectives. Many instrumental studies of corporate social responsibility make explicit and implicit references to stakeholder perspectives (Branco & Rodrigues 2007). The instrumental approach also often makes a connection between stakeholder approaches and commonly desired objectives such as profitability. The normative aspect of stakeholder theory as proposed by Donaldson et al. (1995) has fundamental philosophical and ethical concepts in it. It is used to interpret the function of the firm, including the identification of moral and philosophical guidelines for the management of the firm.

Mitchell et al. (1997), perhaps, offered the most critical and influencing view of stakeholder theory which will be applied in our study. They sought to distinguish stakeholders through the recognition of attributes inherent in them. The stakeholders are evaluated in terms of the relative absence or presence of all or some of the attributes. As such they suggest that a stakeholder has three types of attributes: power, legitimacy and urgency.

The attribute of power, according to Mitchell et al. (1997), is derived from the early Max Weber idea. It is the probability that one actor within a social relationship would be in a position to carry out his own will despite resistance. Some other authors define power as the relationship among social actors in which one social actor, A, can get another social actor B, to do something that B would not otherwise have done (Dahl 1957). Although power is tricky to define, it is not that difficult to recognize. Mitchell et al. (1997) conclude that power is the ability to bring about

the outcomes that one desires. Legitimacy involves its connection with more fundamental philosophical concepts. It is often loosely referred to socially accepted and expected behaviors. Suchman (1995) has worked to strengthen the conceptual notion of legitimacy, based upon Weber's functionalism (1947), Parsons' structural functional theory (1960), open systems theory (Scott 1987) and institutional theory (DiMaggio & Powell 1983). The definition which Suchman suggests is broad based and acknowledges the evaluative, cognitive and socially constructed nature of legitimacy. He defined legitimacy as a generalized perception or assumption that the actions of an entity are desirable, proper or appropriate within some socially constructed systems of norms, values and beliefs (Suchman 1995 p574). Urgency attribute is the criticality and temporality of a stakeholder claim. It is the call for immediate and pressing attention. This particular attribute exists if the stakeholder's claim is of a time-sensitive nature and importance. Therefore, a firm has to pay immediate attention to a stakeholder possessing urgency attribute (Mitchell et al. 1997).

Since our study identifies the manager as the one who deals with or interacts with suppliers and customers as stakeholders, it is imperative that through Mitchell et al.'s (1997) insight, manager has to look into the attributes that a stakeholder possess. For instance, the manager has to determine whether a supplier as a stakeholder possesses power, legitimacy or urgency attributes and likewise for customer. The stakeholders may possess one, two, or all three of the attributes: power, legitimacy and urgency (Mitchell et al. 1997).

2.6 Stakeholder theory and supply chain risk response strategies

The application of Mitchell et al.'s (1997) stakeholder theory in other fields is well documented in the literature. For instance, authors in marketing research have approached the planning and

designing of environmental strategies using stakeholder theory (Polonsky 1995). Bourne & Walker (2006) visualized stakeholder influence on managing projects. They developed a stakeholder circle as a visualization tool based on stakeholder theory and project management thinking to unearth vital stakeholders to a firm. Later, business researchers continued to use stakeholder theory to the development of strategies for relationship marketing in a non-profit organization (Knox & Gruar 2007). Very recently, Vries (2009) assessed projects in the area of inventory management from the stakeholder theory perspective of Mitchell et al. (1997). Only Gregor (2008) applied stakeholder theory to a study corporate risk management which is a close relevant to our study. There exists no other work in the literature that has applied Mitchell et al. (1997) stakeholder theory in the supply chain context in general and supply chain risk management in particular. Hence, this work is an attempt to fill this gap.

To argue how stakeholders affect the firm may, at first, seem a counterintuitive approach to stakeholder theory (Oliver 1991). This is because stakeholder theory is naturally managerial in a sense that it guides the manager to deal with stakeholders (Donaldson and Preston 1995). However, knowing how stakeholders affect the firm is a critical knowledge required of managers as they are expected to act strategically and plan the actions they intend their firm to undertake. Thus it is always presupposed that they know their stakeholders (Frooman 1999). Central to stakeholder theory is the notion that a firm needs to manage stakeholders according to the attributes they possess as perceived by the managers. Hence, if stakeholder theory is to be used, our focus should be on manager's understanding of stakeholder attributes and the consequent risk response strategies the managers put in place in the organization. To the best of our knowledge, there is only one study relating stakeholder attributes to marketing strategies (Know& Gruar 2007). Following this study and due to reasons given above, we propose to use

stakeholder theory in our research too. We highlight that ours will be the first work to consider this aspect in supply chain risk development.

2.7 Risk Attitude of manager as a moderator

For our research, the top manager in a firm is identified as the unit of analysis. He or she will be the participant in this research identifying their perception of stakeholder attributes and their response strategies to supply chain risks. This aspect of a manager's responsibility falls under strategic decision making and so a manager's behavioral aspects of decision-making becomes very important (Cantor 2009) as it plays a crucial role in the determination of strategies. One of the behavioral aspects of decision making is a manager's attitude towards risk. The importance of risk attitude as a moderator in decision-making is well known in the literature (see for example, March and Shapira 1987).

The study of risk attitude[15] as a moderator is deeply grounded in the field of finance and other related fields[16]. For instance, Crum et al. (1981) investigated risk seeking behavior of the decision maker and its implications for financial models. They concluded that a mixture of risk-averse and risk-seeking behavior occurred, with risk-seeking occurring when returns are below a target return or aspiration level and risk-aversion occurring when returns are above a target return. Fellner and Maciejovsky (2007) related individual risk attitude to market behavior by analyzing asset markets. They found that the lower the observed market activity the higher the

[15] Risk attitude is generally modeled as utility functions. Models of risk attitudes obey the normative principles underlying in a wide range of activities such as lotteries. Mathematically, risk attitude is expressed as the generalized-logarithmic utility functions: $u(x) = \log(a + x)$

[16] Risk attitude measurement can also be used in social experiments. For example, Harrison et al. (2009) has studied risk attitude of the rural poor in Ethiopia, India and Uganda. The rural poor faces risk in numerous and profound ways. Therefore, it is an interesting research to collect evidence from risky experiments using poor subjects and contribute to a rich array of theories to explain this type of behaviour.

degree of risk-aversion. Research papers in other areas such as management and psychology have also incorporated risk attitude as a moderator (Manuj and Mentzer 2008).

As our aim in this work is to study managers' response to risks, it is clear that their risk attitudes also play a major role in the identification of these strategies. Accordingly, a search of the literature revealed that much of the early works on individual risks was often isolated from behavior in organizational contexts. One can find, Ritchie and Brindley (2008) who advocated the use of managerial characteristics such as perception of risks as a moderator to SCRM. Hence, in our decision to include risk attitude of managers as a moderator, we draw support from Mitchell et al. (1997). Mitchell et al. (1997) also suggested that the perspective of managers might be vital since they are at the center of the "wheel". They argued further that managerial characteristics such as managerial values are a moderator in a firm's relationship to stakeholders. It is important to distinguish between two common psychological variables (perception towards risk and attitude towards risk) which are often misunderstood (Weber 2002). Kritikos et al. (2009) have emphasized the importance of distinguishing perception of risks and attitudes toward risks. Accordingly, we have proposed to incorporate manager's risk attitude as a moderator and will study its impact on the risk response strategies chosen.

Elicit individual risk attitudes from our samples of managers can be a tough work given that there are no standard tools or methods in the literature. Holt and Laury (2002) used choices over lotteries with real monetary rewards to elicit risk attitudes. They elicited risk attitudes for university students using controlled laboratory experiments. Harrison et al. (2007) extended Holt & Laury's work out of the lab by employing subjects that are more representative of individuals affected by public policy changes. To the best of our knowledge, Weber et al. (2002) presented an easy to use questionnaire to elicit risk attitude which has been tested for its reliability.

3. Research Questions and Model

There is presently a widespread academic recognition of the complexities of supply chain risk management understanding. In parallel, one may say that there also is a great deal of disagreement within the supply chain field as regards the operationalization of supply chain risk management strategies (Wagner 2008). Supplier issues and customer demands call for a continuous re-examination of supply chain risk management. The commitment to general supply chain risk management and strategies always needs to be balanced against limited and scarce resources.

The thesis seeks to understand how stakeholder groups' idiosyncrasies are being recognized in the supply chain's decision making, especially decisions relating to supply chain risk response strategies. In order to gain an understanding of supplier and customer influences in the formulation of supply chain risk response strategies, the following research question have been formulated:

(1) How do managers' perceptions about stakeholder groups' idiosyncrasies[17] influence their choice of risk response strategies?

(2) How do managers' risk attitudes act as a moderator to their choice of risk response strategies?

Thus, in order to answer these research questions, the thesis will focus on only suppliers and customers to focal firm in the supply chain. Consequently, in order to fully explain how their influence is perceived by the manager, it becomes necessary to ascertain the attributes the stakeholders possess. After a search of the literature, we identified the attributes to be power, legitimacy and urgency (Mitchell 1997). As for the response strategies, we choose to use the

[17] Idiosyncrasy means individual characteristics or characteristics of a person or a group.

classification proposed by Choi and Liker (1995), viz. process and buffer oriented risk response strategies.

On the impact of risk attitude on the choice of response strategies, we derive our proposition from Mitchell (1997) who stated that managers' idiosyncrasies or characteristics are moderators and have moderating effect on decision made. Moderators are variables which influence the relationship between independent and dependent variables. Studies in the management and related areas generally considered characteristics such as managers' values. This study will consider risk attitude as a moderator. As risk attitude form part of managers' characteristics, we propose to study risk attitude as a moderator to the choice of response strategies. Based on these observations, we have formulated a model which is presented in Figure 4.

The model shows the impact of stakeholder attributes on managers' risk response strategies. The stakeholder attributes are considered independent variables, risk response strategies are considered as dependent variables and managers' risk attitude as the moderator. This study will employ regression analysis on the data to be gathered from firms[18] in Singapore. If sample size permits, the study would apply more sophisticated multivariate data analysis in the research.

In the sections to follow, we elaborate on the points above. We will also define the constructs that are going to be considered.

[18] The firms included in the study will be adopted from the directory of Singapore Logistics Association, Singapore Manufacturers' Federation and Association of Electronic Industries in Singapore.

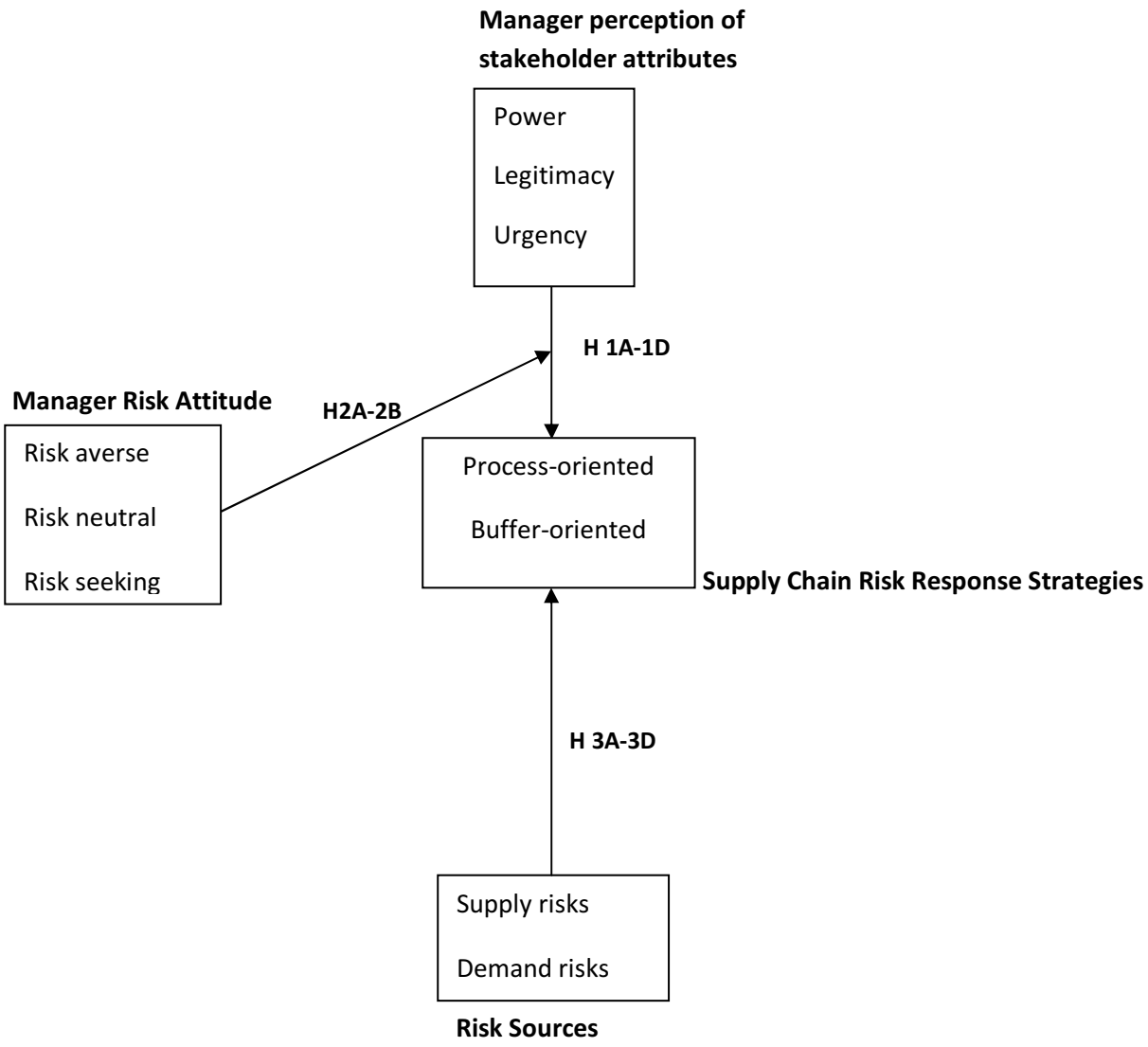

Figure 4. Research Model

3.1. Stakeholder attributes and supply chain risk response strategies

There exists complexity and diversity within the organizational world (Cludts 1999). Firms and organizations are now viewed as complex dynamic networks and embedded in a permanent state of ambiguity. We are invited not only to recognize ambiguity and diversity, but also to accept them. The firms are assumed to have diverse needs and wants. Firms are conceived as polyphonic, speaking different voices according to the varying contexts and narratives of which they are part. The normative stakeholder approach provides normative basis grounding for us to cope with such complexity and networks. The core intuition of the stakeholder theory, as mentioned previously in the literature review, is that a series of stakeholders are so closely related to the firm, that they should be entitled co-decision rights on the strategic level of the firm. Stakeholder theory explicitly acknowledges the central role of the conflicts that inevitable arise between stakeholders and firm.

In the stakeholder literature, there exists the highly appealing idea that paying special attention to stakeholders is a good business practice and solution to any business conflicts (Jones 1995). This brings our attention to the attributes that a stakeholder possesses. It is stated that a stakeholder can possess power, legitimacy and urgency attributes of varying degree (Mitchell 1997). Mitchell (1997) recommended that managers ought to do nothing about stakeholders who they believe possess only one of the three attributes, and that managers have a clear and immediate mandate to give more attention to stakeholders having two or more attributes. This is due to the limited resources available to manage stakeholders.

Extending this idea to SCRM, our theory is that the extent and choice to which a particular supply chain risk response strategy is selected for use by managers will be correlated to the type

and the number of attributes a stakeholder is perceived to have[19]. It is also supported that in a complex and changing environment, there cannot exist such thing as *the one* successful managerial or risk response strategy (Cludts 1999). Different risk response strategies have to be tailored to different stakeholders.

We then use the classification provided by Choi and Liker (1995) on the risk response strategies. They are process oriented and buffer oriented risk response strategies.

Based on this, we propose to test the following hypotheses:

> **Hypothesis 1:** Stakeholder attributes as perceived by managers is positively related to the extent to which managers are using process oriented risk response strategies and buffer oriented risk response strategies.

Specifically, we want to study two groups of stakeholders identifiable to a firm. They are suppliers and customers. Therefore, we hypothesize supplier as:

> **Hypothesis 1A:** Supplier attributes as perceived by managers is positively related to the extent to which managers are using process oriented risk response strategies.
>
> **Hypothesis 1B:** Supplier attributes as perceived by managers is positively related to the extent to which managers are using buffer oriented risk response strategies.

For customer stakeholder group, we hypothesize:

> **Hypothesis 1C:** Customer attributes as perceived by managers is positively related to the extent to which managers are using process oriented risk response strategies.
>
> **Hypothesis 1D:** Customer attributes as perceived by managers is positively related to the extent to which managers are using buffer oriented risk response strategies.

[19] Our study is exactly the "mirror" image of Frooman and Murrell (2005). They examined the strategies that stakeholders select to exert influence on a firm.

3.2. Managers' risk attitudes as a moderator

The main proposition of this research is that manager's risk attitude plays a critical role for the selection of risk response strategies. The combination of supply chain risks and risk response is concretized and covered by the use of individual's risk acceptance level where managers are willing to take risks falling below a certain threshold and, in turn, use risk response strategies when risk is above the threshold (Wiseman & Gomez-Meija 1998). The level of this threshold depends on the risk attitude of each individual, being risk-averse[20], risk neutral[21]or risk-seeking[22] (March & Shapira 1987).

Given that the business principles and moral behavior of business leaders are complex and that they vary with time, geography and culture (Sen 1997), it is likely that the presence or absence of stakeholder attributes on risk response strategies is shaped by managers' risk attitude. Manager's risk attitude has been acknowledged to be an important topic for the understanding of supply chain risk management (Manuj & Mentzer 2008). As can be learned from software risk management research (Charette 1996; Lauer 1996) and managerial research (Wallace et al. 2004), the level of risk management activities (e.g. the selection of risk response strategies) is greatly influenced by manager's risk aversion profile. It is accepted that risk-averse managers take comprehensive actions to fully understand the risk profile of their stakeholders. Risk-seeking managers, in turn, will tend to strive for extra benefits and neglect the use of risk response strategies.

Because managers vary greatly in their risk attitudes (Hillson 2007), substantial variation in risk response strategies as a function of such variability is to be expected. For this reason, managers'

[20] Risk averse: choosing low risk alternatives (Lauer 1996).
[21] Risk neutral: choosing moderate risk alternative (March & Shapira 1987).
[22] Risk seeking: choosing high risk alternatives (Lauer 1996; March & Shapira 1987).

risk attitudes are thought to act as a moderator influencing risk response strategies (Manuj 2008). For example, when dealing with a risky alternative whose possible outcomes are generally good (e.g. gain in monetary benefits), human subjects appear to be risk averse and if they are dealing with a risky alternative whose possible outcomes are generally poor, human subjects tend to be risk seeking. This has strong implication; the risk-seeking or risk-averse attitudes of a decision maker may impact on risk response decisions (Manuj 2008).

Although a number of studies have pointed out the negative effects of uncertainty or risk in supply chain, there is virtually absence of references examining the impact of manager's risk aversion, risk neutrality or risk-seeking behavior on the selection of risk response strategies. If managers are risk averse, they will introduce more risk response strategies than might be expected (Aubert et al. 2005). Risk seeking managers will be inclined to omit risk mitigation and will search for potential gains. As a result, the main argument of this research is that supply chain risk research should pay greater attention on manager's risk attitude profile.

We propose that managers' risk attitude has a moderating effect to their choice of risk response strategies. The hypotheses are as follows:

> **Hypothesis 2:** The impact of the stakeholder attributes on risk response strategies is moderated by manager's risk attitude.

Since managers' risk attitudes are expected to differ on a continuum anchored at one end by risk-averse and risk-seeking at the other end with risk neutral in between, we specifically hypothesize that:

> **Hypothesis 2A:** The impact of the supplier attributes on risk response strategies is moderated by manager's risk tolerance.

Hypothesis 2B: The impact of the customer attributes on risk response strategies is moderated by manager's risk tolerance.

3.3. Relationships between risk sources and supply chain risk response strategies

The recent past has seen a surge in interest of researchers and practitioners in the area of supply chain risk (Kouvelis et al. 2006). Many researchers are becoming interested in the area of SCRM and identified gap in terms of research dealing with risk sources within the supply chain (Rao and Goldsby 2009). It has been studied that demand and supply risks represent the most prevalent supply chain risks (Zsidisin et al. 2008). For example, the issues of volatile customer demand and poor quality products from supplier have significantly affected many firms during the past few years.

Based on a review of the literature, there exist studies done on risk sources and risk response strategies, albeit separately (Wagner 2008). Therefore, it is of valuable research to investigate the relationship between risk sources and risk response strategies in an attempt to identify the most appropriate management techniques.

This study proposes that suppliers and customers are two distinct stakeholders that pose risks to a central firm. As discuss in previous section, supply risk originates from numerous sources. The four sources of supply risk investigated in this research consists uncompetitive prices, poor quality, supplier bankruptcy and supplier's technology behind competitors. We hypothesize:

Hypothesis 3A: The extent to which managers are involved in using process oriented risk response strategies is positively related to the perceived degree of supply risk sources.

Hypothesis 3B: The extent to which managers are involved in using buffer oriented risk response strategies is positively related to the perceived degree of supply risk sources.

Manager in a firm also manage risk arise from demand side. Demand risk originates from numerous sources. The three sources of demand risk investigated in this research consists volatile demand, short-lived product and bad payment behavior from customer. Therefore:

> **Hypothesis 3C**: The extent to which managers are involved in using process oriented risk response strategies is positively related to the perceived degree of demand risk sources.
>
> **Hypothesis 3D**: The extent to which managers are involved in using buffer oriented risk response strategies is positively related to the perceived degree of demand risk sources.

4. Research Method

4.1. Why a survey based empirical research?

The study is oriented towards theory building research. There are two major classification of research: analytical and empirical. Empirical research is the main methodology in this study. The purpose is to empirically verify our theoretical relationships in samples from actual businesses. Survey which gathers data for statistical analyses is one of the methods used to test empirical support for our proposed theoretical relationships in large samples in real world (Meredith et al. 1989). Survey research is accepted as a legitimate methodology for understanding the core issues and problems that supply chain risk management faces (Rungtusanatham 2003).

The use of an internet-survey based empirical research is common in the literature of operations management.[23] An internet-survey based empirical research complements the more traditional methodologies such as case study and mathematical models by providing a controlled test of the hypothesized relationships. While designed empirical research has been widely used in fields such as psychology, consumer behavior and behavioral decision-making (Payne et al. 1993), it has been lacking in field such as operations management where the target sample is disperse and not confined in a laboratory. Empirical based research in supply chain risk management presents special and daunting challenges.[24] Unlike research in the area of psychology where a convenience sample (i.e., undergraduate and graduate students) can be used, the ideal and perfect sample for supply chain risk management research constitutes real business people on the business floor. Given the extremely diverse locations of these business people, it is impossible to conduct a traditional laboratory (Susan et al. 2006). By using an internet based questionnaire, we

[23] Prior related study (on stakeholder theory and supply chain collaboration) was published in a Operations & Production Management Journal (Co and Frank, 2009).

[24] The special challenges include the ability to have business contacts for survey response and the finance matters required for the massive mailings to potential respondents.

can overcome the problem of geographical dispersion yet maintaining the control of a research design.

The design of this master thesis research exercise, as shown in the figure 5 below, outlines the major research phases leading up to thesis closure. The previous chapters explained the theoretical foundation and the development of our research questions together with our conceptual model. In what follows, we further elaborate on other steps.

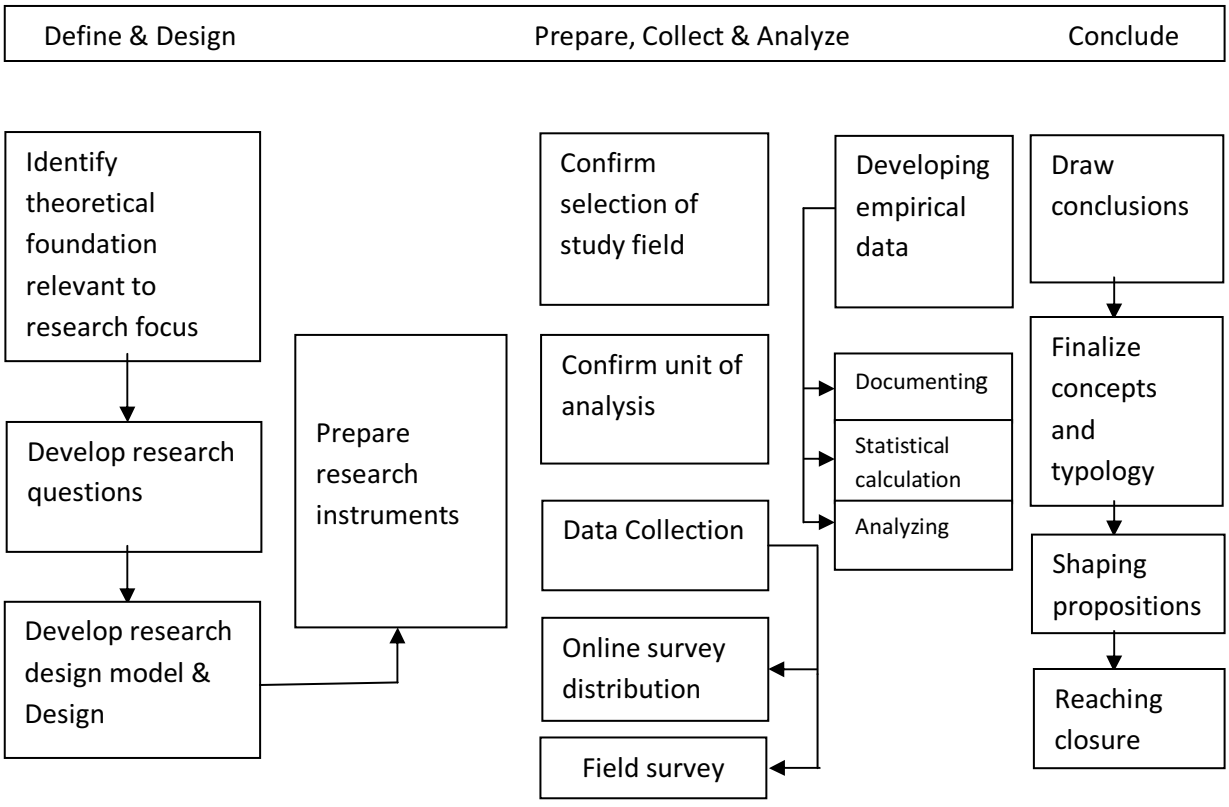

Figure 5. Major Research Phase

4.2. Research plan and questionnaire design

Having completed the identification of the model and the research questions, we then embarked on designing our survey instrument. To this end, we conducted an extensive and intensive study of the literature to identify existing measures for the constructs in our model and identify scales used in the past research for our constructs. For constructs which had not been well documented and tested in the literature, we decided to develop new items based on our understanding of the constructs. Newly created scales were based upon the literature review and associated theoretical foundation presented earlier, following the paradigm of Churchill (1979).

The first construct is the attributes of a stakeholder. The measures for the attributes are power, legitimacy and urgency which have been adapted from Agle et al. (1999). We used a subset of their items, selecting those that explicitly describe power, legitimacy and urgency questions. Respondents will be asked to indicate the extent of their agreement with statements concerning the power, legitimacy and urgency of their supplier and customer group, using a Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree) (Flynn et al. 1990). The Likert scale is used because it is necessary to obtain the managers' perception of the attributes of stakeholders. The second constructs are process-oriented and buffer-oriented risk response strategies. The measures are adopted from Zsidisin et al. (2003) and Zsidisin et al. (2008). The third set of measures for supply and demand risks construct are also adopted from Zsidisin et al. (2003). For both measures, we will use the Likert scale ranging from 1(strongly disagree) to 5 (strongly agree) for the same reason stated above.

The final construct is the risk attitude of the manager. There are not many ready to use risk attitude questionnaire in the literature. The few existing measures in risk attitude have proven to be unsatisfactory (Weber et al. 2002). Weber et al. (2002) is one of the few authors who have

provided a new risk attitude scale that allows researchers to assess risk attitudes in six commonly encountered domains. The six domains are ethical, investment, gambling, safety, recreational and social. Interested readers are referred to Weber et al. (2002) for a detailed discussion of each domain. As for our study, we decided to select questions from the different domain to assess managers' risk attitude. This assumes that managers' decision making involve choices and alternatives in SCRM which is akin to the extent of participation of activities used in the questionnaire.

The questionnaire has been written in English[25] and includes a cover page providing a brief description of the survey and the study's objectives. The questionnaire can be found in Appendix A at the end of this thesis. As per SMU guidelines, our research is required to be approved by University-level Institutional Review Board (IRB) as human subjects will be involved in the research. Our questionnaire was sent to SMU-IRB and approved approximately a month later[26].

4.3. Pre-test

A pre-test was conducted to verify and select our research materials. The pre-test also served as a preliminary assessment of the validity and clarity of the survey[27] (Alreck and Settle 1994). The pre-test is an integral part of survey construction as it provides feedback on how easy the survey can be completed and which concepts are unclear to our respondents' range of knowledge and responsibility (Flynn et al. 1990). The questions in the survey were selected after a pre-test is

[25] See appendix for the full questionnaire that was distributed.
[26] The questionnaire was approved on 26 January 2010 under the Category 1. The SMU-IRB approval number is IRB-10-0006-A0005.
[27] Montgomery (2005) also recognized that a pre-test served as a preliminary validity and clarity of the survey.

conducted among 3 MBA students[28], 2 Operations Management[29] and 2 Management[30] students of a Singapore university.

In the pre-test, each respondent was asked to evaluate statements describing a typical supplier, supply risks[31] faced and supply risk response strategies[32]. The respondents were also asked to evaluate similar statements for the demand side. After reading and evaluating all the questions, the respondents gave their responses accordingly and commented on the layout and design of it. We took into account all suggestions and improved our survey readily compared to the one suggested in the thesis proposal.

For the types of questions covered in this survey respondents with sufficient level of seniority tend to be more reliable sources of information than the junior managers, in accordance with Phillips (1981). Frohlich and Westbrook (2002) felt that managers with enough seniority are able to know about their companies' upstream and downstream issues. This is also consistent with many past survey-based research studies in supply chain risk management (Braunscheidel and Suresh 2009).

[28] The use of student samples for the purpose of pre-test is well-accepted and has significant precedence in behaviorally oriented disciplines. With the introduction of proper design and control, the MBA sample subjects have been shown to be competent and knowledge to respond to simulated business situations and produce data pretty consistent with data collected from "real" business subjects (Schriesheim and Hinkin 1990). Flynn et al. (1990) confirmed the selection of a convenience sample such as students in an MBA class. Earlier, Remus (1986) also recognized the use of student samples for pre-test.

[29] Operations management students are chosen as they have the requisite knowledge.

[30] It should be noted that Management students, though may not have deep relevant knowledge as the MBA or Operations management students, have the ability to comment on the suitability of Stakeholder theory in our research. They can also provide insights as how to design a good questionnaire before it is administered.

[31] We include "Others, please specify:" to elicit more supply risks that we didn't include in the questionnaire.

[32] We include "Others, please specify:" to elicit more supply risks response strategies that we didn't include in the questionnaire.

4.4. Sampling and data collection

The advantage of conducting survey in Singapore is the small land area[33], reliable telecommunications and the large amount of firms located in it. To obtain a representative sample, we randomly selected companies from the directory of Singapore Logistics Association, Singapore Manufacturers' Federation, Association of Electronic Industries in Singapore and directory in Yellow Pages. In order to contact the respondents in an efficient and cost-effective manner, a web-based survey was employed, based on the methods of Dillman (2000). The survey was hosted on the university recommended survey software with the university's logo to add legitimacy and to allay fears of accessing a website that may pose potential harm in the way of computer viruses.

We sent the questionnaire to the key informant, along with a cover letter highlighting the study's objectives. The cover letter explained the purpose of the study and assured confidentiality of the responses. Respondents were encouraged to participate by entitlement to a summary report. The surveys were distributed online and reminder emails were sent to improve the response rate. Out of the 1219 companies to which the surveys were distributed, a total of 235 companies responded to the questionnaires. After sorting, only 203 usable surveys were identified. The response rate was 16.7%, a figure considered quite reasonable for an online questionnaire (Malhotra and Grover 1998).

We have received a wide range of levels of managers participating in our survey. Figure 6 shows the number of managers in various level participated. The sample respondents are mainly from

[33] Singapore is an island city-state off the southern tip of the Malay Peninsula. At 710.2 km square, Singapore is considered as a micro-state.

middle (28.57%), upper middle (36.95%) to top managers (10.34%). Respondent ages ranged from 26 to 50 years. Seventy-three percent were

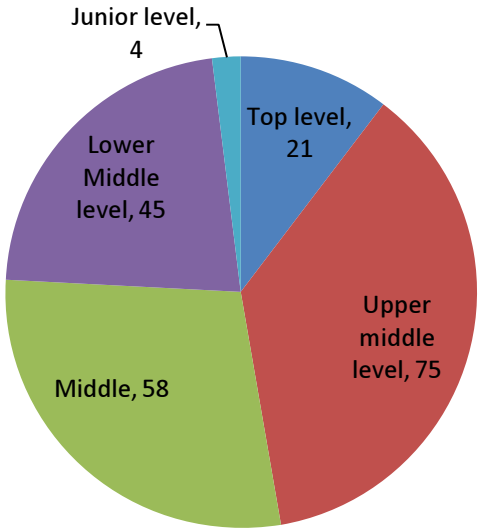

Figure 6. Number of different level of managers involved in the study

male and 27% were female. There are a wide range of industry who responded to our survey ranging from electronic & electrical, manufacturing, chemical and others as seen in Figure 7. It is hoped that the number of participants in the mature group such as 30 year old and above is greater as they are more experienced in the industry. Nevertheless, we still receive a significant amount of responses from them as seen in Figure 8. The majority of respondents falls in the age group of 26-30 years old reflecting the huge proportion of young working force in Singapore.

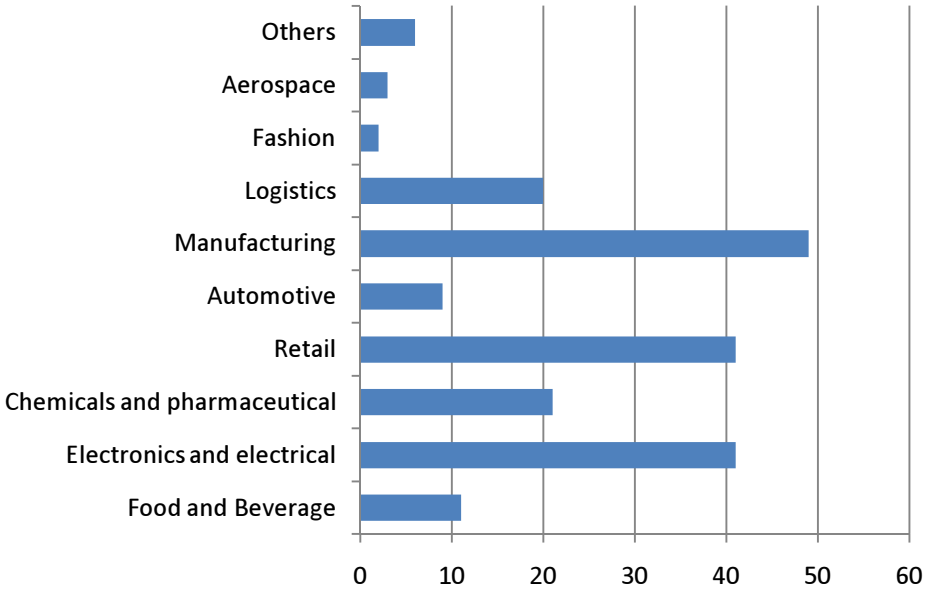

Figure 7. Industry type

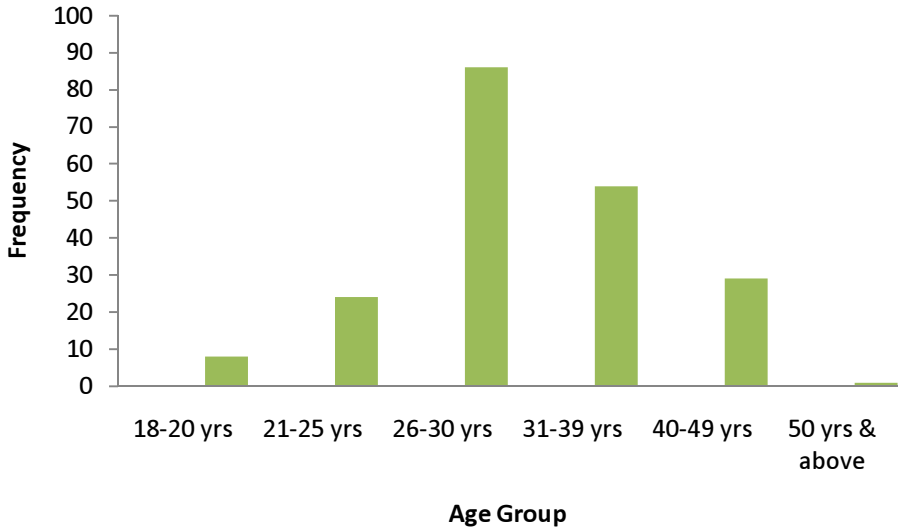

Figure 8. Age of respondents

5. Statistical analysis and results

The data analysis in this research consisted of constructing regression models to discover the relationships between stakeholder attributes and risk response strategies. We first tested for non-response bias. Factor analysis was done to verify our risk response strategies constructs. Moderated regression analysis was performed to examine the effect of risk attitude. Finally, test is run to determine the relationship between risk sources and the risk response strategies. Summary of the findings are present in the form of tables.

5.1 Non-response bias

It is strongly supported that non-response bias is always a threat to survey research[34], even with high response rates (Armstrong and Overton 1977). Bias is the departure of an estimate based on the sample of participants from the population value (Lueptow et al. 1978). In particular, for operation management research there is a hazard that the data only reflects prosperous or successful companies when response rates are not high. One of the tests for non response bias is to compare the data of early and late respondents[35]. As discussed by Armstrong and Overton (1977), the group of late respondents is likely to respond to survey. A multivariate Hotelling T-test was computed, comparing the first wave of respondents with the second wave of surveys, and provided statistical evidence of absence of non-response bias with Hotelling T test=1.682, p=0.368.

[34] Survey research especially web survey is becoming increasingly accepted (Couper 2000). It is often seen as a strategy to decrease costs, increase the speed of data collection and increase response rates with the hope of decreasing the amount of non-response error. It should be noted that though web surveys can be a quick and cost-effective option to survey special populations, it is a particular concern as response rates to web surveys tend to be lower than to the other modes (Couper et al. 1999). Therefore, it is important to understand the extent to which our data are biased by non-response.

[35] Our first wave of respondents is in the month of Feb 2010. With reminder email sent on 1 and 2 March 2010, the second respondents shall fall within the month of March 2010. Taking into consideration of the time from Feb 2010 to reminder email, there is some time gap which could lead to non-response bias argument.

5.2 Reliability and Factor analysis

Reliability analysis was done to measure the extent to which the survey administered will yield the same results (Flynn et al. 1990) and to test the variance of random measurement errors among the questions. The most widely accepted measure of reliability is Cronbach's Alpha (Cronbach & Meehl 1955). Reliability analysis is a prerequisite, though insufficient condition, for construct validity (Churchill 1979). The reliability coefficient can be found in Table 1. The Cronbach's alpha value for both process and buffer oriented risk response strategies are in the range of 0.65 to 0.75, which is the acceptable threshold in every research (Flynn et al. 1990; Hair et al. 1995).

Validity analysis was done to measure the true purpose of the scale and assess whether a scale is an appropriate operational definition of a construct. Generally, three different types of validity can be used- content validity, criterion-related validity, and construct validity. Of the three, construct validity is the primary concern[36] for our research. Factor analysis is useful in establishing our construct validity on management of supply and demand risk sources. Factors for both supply and demand risk management were extracted using principal component analysis followed by a promax rotation. The first factor, found in table 1, classified as process oriented risk response strategies under the supply side consisted of three items. The items *frequent contact with the typical supplier, supplier certification* and *requiring supplier to produce a business continuity plan* all measure strategies used by the firm to reduce the chance that supply risks may occur. The second factor had two items including *safety stocks* and *multiple sources usage* which are categorized under buffer oriented risk response strategies. On the demand risk

[36] Construct validity comes closest to the general definition of validity and is the top and primary concern for research seeking to empirically test relationships among constructs.

Table 1. Factor Analysis

Survey Item	Rotated Factor Pattern	
	Process oriented risk response strategies	Buffer oriented risk response strategies
Supply risk response strategies		
Frequent contact with the typical supplier	**0.691**	-0.06
Supplier certification	**0.682**	-0.12
Require supplier to produce a business continuity plan	**0.749**	0.156
Safety stock	-0.02	**0.744**
Using multiple supply sources	-0.014	**0.778**
Variance explained	1.504	1.203
Coefficient α	0.68	0.71
Demand risk response strategies		
Price the product in a flexible way	**0.625**	0.563
Increase channels for products or service provided	**0.91**	-0.109
Produce extensions of the current product	0.161	**0.759**
Variance explained	1.224	1.18
Coefficient α	0.70	0.64

response strategies, the first factor categorized under process oriented risk response strategies has two items out of a total of three items. The two items are *price the products in a flexible way* and *increase channels for products or service provided* which all measure techniques used by firms to reduce the chance that demand risk may occur. The second factor is the remaining item *produce extensions of the current product* used to reduce the consequences of demand risk. This second factor is labeled buffer oriented risk response strategies.

5.3 Hypothesis testing

The results presented in Tables 2 and 3 show the findings for Hypotheses 1A-D. In Table 2, one obvious result can be seen in the regression analysis is that all three supplier attributes are negatively correlated to the process oriented risk management. This means that managers employ process oriented risk response strategies extensively when they perceive the supplier stakeholder to be low in power, legitimacy and urgency. Therefore, Hypothesis 1A is rejected. However, the inverse relationship between supplier attributes and process oriented risk response strategies could not be established as it is not significantly supported. Hypothesis 1B posits that the buffer oriented risk response strategy is positively related to the supplier attributes. In order to test this hypothesis, we conducted regression analysis to show that managers are very likely to employ buffer oriented risk response strategies when perception of supplier attributes is high. This is especially so with respect to legitimacy ($p<.05$) attributes.

Table 3 shows the result of regression analyses testing Hypotheses 1C-D. We see that process ($p<.05$) and buffer ($p<.10$) oriented risk response strategies is significantly related to customer power attributes. However, except for these findings the overall pattern of results is one of nonsignificance. Thus although some significant effect is found, it appears that the majority of the evidence does not allow us to accept the Hypotheses 1C and 1D.

Table 2 Results of Regression Analysis: Hypothesis 1A-B

	Process oriented risk response strategies	Buffer oriented risk response strategies
Supplier Power	-0.02	0.053
Supplier Legitimacy	-0.001	0.159**
Supplier Urgency	-0.089	-0.013*

*p<.10; **p<.05; ***p<.01

Table 3 Results of Regression Analysis: Hypothesis 1C-D

	Process oriented risk response strategies	Buffer oriented risk response strategies
Customer power	0.231**	0.197*
Customer legitimacy	-0.159	-0.121
Customer urgency	-0.239**	-0.035

*p<.10; **p<.05; ***p<.01

Moderated hierarchical regression was performed to assess the moderating effect of risk attitude on the stakeholder attributes on risk response strategies. First, risk response strategies were regressed on the combination of stakeholder attributes. The next step added the interaction terms of the risk attitude. The contribution of R^2 provided by the interaction terms added to the model was then evaluated. If the change in R^2 is significant, then the interactions account for a significant portion of the total explained variance beyond the main effects. Then we can conclude that the relationship between the variable and risk response strategies is moderated by risk attitudes (Cohen & Cohen, 1983). The results of the moderated[37] regression analyses are provided in Table 4.

Table 4 shows the results of moderated regression analyses testing Hypotheses 2A-2B. None of the stakeholder, supplier or customer, shows a significant effect on the risk response strategies for the interaction between manager's risk attitude, as measured by the instruments and stakeholder attributes. These findings result in the overall pattern of nonsignificance. It appears

[37] The increasing complexity of operation management research results in the number of studies hypothesizing and testing for moderation effects. Moderator effects are the most interesting and yet the toughest to establish empirically (McClelland and Judd 1993). Unfortunately, even a casual reader of research in operations management and strategy can find examples of inappropriate research methods in studies examining moderation effects. One common error in drawing conclusions about moderation effects is the inappropriate use or interpretation of statistics (Carte and Russell 2003). Investigators and researchers must use ΔR^2 instead of b_3 to draw conclusions about relative moderator effect sizes.

that the majority of evidence does not allow us to reject the null hypothesis, that risk attitudes have no moderating effect. Explanation will be given in the next chapter.

Table 4 Moderated Regression Results: Moderating Effects of Risk attitude on stakeholder attributes to risk response strategies

Variable	Process oriented risk response strategies		Buffer oriented risk response strategies	
	R-squared	ΔR-squared	R-squared	ΔR-squared
Risk attitude Supplier power, legitimacy and urgency	0.010		0.065***	
Risk attitude	0.024	0.014	0.061***	-0.004
n	203		203	
Risk attitude Customer power, legitimacy and urgency	0.0843***		0.054	
Risk attitude	0.0871	0.0028	0.07	0.02
n	72		72	

*p<.01; **p<.05; *** p<.01

Hypothesis 3 posits a positive relationship between the risk sources and the likelihood to use risk response strategies. A regression analysis is performed and the test ($p<0.10$) strongly confirms this relationship H3B such that the higher the degree of supply risk sources the greater the extent of buffer oriented risk response strategies employed. There is no evidence allowing us to reject the null hypothesis of H3A that process oriented risk response strategies is not related to the perceived degree of supply risk sources. As for the demand side, there exists a significant effect ($p<0.10$) on the positive relationship between the perceived degree of demand risk sources and

the extent of process oriented risk response strategies, hence H3C is supported. There is no significant evidence supporting H3D. Table 5 presents the overall findings.

Table 5. Result of Regression Analysis

	Process oriented risk response strategies	Buffer oriented risk response strategies	
Supply risk	-0.019	0.103*	*p=0.1429
Demand risk	0.193*	-0.006	*p<0.10

6 Discussion of results

6.1 Stakeholder attributes, risk response strategies, risk attitude and risk sources

The empirical results extend the current literature to date in three important ways. First, the type of attributes that contributes to the type of risk response strategies differs; second the risk attitude only affect certain risk response strategies and attributes; and third, the result offer insights into which risk response strategy is employed for the various risk sources.

It should be noted clearly in the survey that not all stakeholder attributes are positively correlated to the risk response strategies. Only supplier legitimacy has a significant positive relationship to buffer oriented risk response strategies. Other supplier attributes have no significant effect or negatively correlated. This finding confirms anecdotal evidence presented by Freeman, Clarkson, Donaldson and Preston (1995) suggesting that manager pays attention to suppliers who have legitimate (e.g., moral, legal, and equity-based) claims. One interesting fact that can be found between customer attributes and risk response strategies is that the customer power attribute has significant relationship between both process and buffer oriented risk response strategies. This finding partially supports Mitchell (1997)'s incorporation of stakeholder power in the analysis because customer power attributes will make a critical difference in managers' ability to make decision.

Our study allows us to measure the importance of risk attitude as a moderation or influence to our model. While past studies have shown the risk attitude as a moderator in other fields such as psychology and marketing, the application in supply chain remained largely unstudied. By using the difference in R-squared method, we were able to determine whether risk attitude plays a role in the moderation of stakeholder attributes and strategies chosen. The result suggests that risk attitude has a stronger moderating effect between buffer oriented risk response strategies and supplier attributes rather than process oriented strategies. On the customer side, there is no

significant result suggesting that risk attitude plays a moderating role. Since these tests showed few moderating effects generally, it suggests that much more work should be done on risk attitude before researchers will be able to fully understand the phenomena.

The hypothesis test has also allowed us to test the influence of supply and demand risk sources on the choice of risk response strategies. Prior research suggests that the more extensive risk sources are, the extent to which manager uses risk response strategies will be higher. It simply means there is a positive correlation between risk sources and risk response strategies. However, risk response strategies encompass variations such as process oriented and buffer oriented. It would be simplistic to group them into one. From our study, we hypothesized that risk response strategies can be divided into two categories: process and buffer which are positively correlated to supply and demand risk sources. The hypothesis for supply risk sources are positively correlated to buffer oriented risk response strategies is weakly supported. The common perception that firms are moving away from carrying more inventories is still far from it. It may be that buffer oriented risk response strategies still present an attractive option for managers. The hypothesis that demand risk sources are positively correlated to process oriented risk response strategies is significantly supported; managers prefer to price the products in a flexible way instead of mass producing extensions of the current product.

6.2 Implications for practice

Practical implications arise for the managers in a firm. To the manager, the empirical results confirm that some attributes, not all attributes, are related to their selection of risk response strategies. After all, only legitimacy attribute is positively correlated to buffer oriented risk response strategies. This result reveals that managers will stock up more goods to buffer in

period of difficulty if they perceive the suppliers to have high legitimacy. This is important for managers to understand since, traditionally, stakeholder such as supplier is viewed having legitimate and moral claims on the central firm. As such, the central firm believes that the supplier has the right to request and expect things to be done accordingly, as part of the supplier-firm relationship. This is a result of the level of importance accorded the supplier in the supply chain and such importance could be that supplier has the exclusive technology or expertise to produce what the central firm requires. Another legitimacy of the supplier concerns the strong legal setting in Singapore. This states that the central firm accord strong legal status to its suppliers as breaking any contract with them will bring repercussion beyond imagination. In response to these, the result shows that firm will prefer to employ buffer oriented risk response strategies.

On the customer side, the statistical results confirm that power attribute of customers is positively correlated to both process and buffer oriented risk response strategies. This is important since customers have power to "change" the firm. According to Goodman and Dion (2001), customers have the power to influence the decision of a firm through various categories of power. They may have reward power by ordering more goods from the firm thus providing additionally business. Additionally, customers could have coercive power through cancellation of business or reduce the volume of business with the central firm. Therefore, the central firm needs to employ more resources through both process and buffer methods to manage its relationship with the customers.

In the statistical results on Hypothesis 3, it is shown that firm still prefers to have more goods stock in their warehouse to counter supply risks. This is a conventional way of response strategies employed by firm. However, there is a trend or call for taking up more process

oriented risk response strategy as it is a better "tool" in ensuring smooth delivery of goods from supplier. This is an indication that many firms, in practice, use slack (inventory, multiple supply sources) to limit any materializing disruption. We can see the opposite in demand risk. It is significantly supported that managers are using process oriented when encountered with demand risks. It could be that buffer strategy such as producing extension of the current product may not be suitable for the majority of the companies except in toy industry (e.g. Lego). Therefore, overall, managers still prefer to use process oriented way to deal with customers.

7. Conclusions and limitations

We have provided a holistic perspective of firm's perception of its stakeholders by employing stakeholder theory, and investigated the interaction effect of risk attitude. Our study is the first to study these relationships using data collected from firms in Singapore. Because of Singapore's advance manufacturing base, our findings provide fruitful managerial implications for both supply chain practitioners and researchers.

This study has made a contribution to the SCRM and stakeholder theory by systematically examining the influence of stakeholder attributes on risk response strategies. Overall, the results show that only selected attributes, not all attributes, are positively correlated to manager's choice of each process and buffer oriented risk response strategies. For this sample, supplier's legitimacy attribute is the best predictor of buffer oriented risk response strategies. This finding confirms anecdotal evidence presented by scholars such as Freeman and Clarkson suggesting that suppliers have legitimate claims and firms pay attention to them by employing conventional ways such as increasing warehouse stock and engaging many suppliers at one time. Results differ in the customer stakeholder. We note that only customer's power attribute is the best

positive predictor of both categories of risk response strategies. This finding again confirms the importance of power attribute in stakeholder-manager relations as introduced in the contemporary stakeholder theory by Mitchell (1997).

This study shows that risk attitude are of no moderating effect to our model. Traditionally, it is argued that manager who is risk averse will response more and, in our case, affects the use of risk response strategies. We view the absence of the risk attitude moderating relationships to be one of the guiding steps towards a more focused research in the future. Firstly, risk attitude scale has not been widely used universally compared to other grounded psychology scales. Additionally, we should note that risk attitude is not static but is constantly evolving and on the move. It simply means risk attitude may differ from time A to time B depending on the circumstances that a manager is "embedded" in. For example, in the wake of financial crisis an individual, in the face of credit crunch, may have a low appetite for risk. Vice versa, an individual or manager will want to have more using less resource hence having a big appetite for risk. Finally, decision making of an individual is not necessary decided by an individual's risk attitude. Other characteristics such as individual's values (Agle et al. 1999) could combine with risk attitude to give a more targeted explanation on the relationship between stakeholder attributes and choice of risk response strategies.

Although this study makes a contribution to both academia and practice, there are several limitations which open up venues for further research. First, we only used data from Singapore to develop and test the model. Although the risk response strategies had an acceptable Cronbach's alpha, it was relatively low. Future studies should further this construct, especially demand risk response strategies given the relatively limited literature on it, to provide a deeper understanding of it in Singapore. Because culture may play an important role on the manager's perception of

the stakeholder attributes, future studies should examine configural and structural differences in these constructs and their relationship in different cultures.

It should be noted that risk attitude is one of the personal characteristics that can influence a decision making process, There are additional personal characteristics that can influence the decision of the manager; one issue especially relevant to our supply chain decision-making context is the perception of importance. When a manager feels that the judgment is important they tend to become more involved in the decision process (Petty, Cacioppo, & Schumann, 1983). Intuitively one might expect that a feeling of importance in the decision would alter the choice of risk response strategies. In addition, other personal characteristics such manager's value could be incorporated to capture a more holistic and dynamic business decision context.

Furthermore, this study only examines sources of suppliers and customers attributes from the perspective of the manager in a central firm. Future studies should collect the perspectives from the suppliers and customers, which may shed new light on the relationship between them and the central firm.

Finally, this study only examines dyadic relationship between supplier and firm, firm and customer. To understand the entire supply chain risk management, future studies should examine relationships with more stakeholders (e.g. government, interest groups and employees) and the central firm together as it may reveal more complex dynamic relationships between risk response strategies and their attributes.

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Appendix A

Information Sheet

Dear Sir/Madam,

A Survey Study on Supply Chain Risks Management in Singapore

You are invited to take part in a research project on a survey on supply chain risks in Singapore.

If you are able to be involved in the study, please respond to the attached questionnaire entitled: A Survey on **Supply Chain Risks Management in Singapore**. The survey contains questions relating to your attitudes and perceptions about your firms, risk management activities you normally engage in, and some personal information. The questionnaire will take less than 10 minutes of your time. Please kindly return the completed questionnaire through using the enclosed envelope.

Your views are highly valuable and your response will be kept confidential. Participation in this research is voluntary. Refusal to participate will involve no loss of benefit to which you are otherwise entitled. Your participation may be discontinued anytime without penalty or loss of benefits. By completing and returning the questionnaire, you have indicated your consent to participate in this study and that you are at least 18 years of age. If you have any queries regarding your decision to participate, please contact the IRB secretariat, Ms Stephanie Tan at irb@smu.edu.sg or telephone (65)68281925.

The data from the study will be used solely for the purpose of academic research. The researcher will not be able to obtain your identity in any way from your completed questionnaire. The research thesis will not mention the nature of the work of your organization where this study is conducted. If you need any clarification on this questionnaire, please feel free to contact me, Shujian at 96941796 or email shujian.lim.2008@mom.smu.edu.sg .

Please keep or print this copy of informed consent information sheet for your own reference.

Thank you for your participation.

Yours faithfully,

Shujian Lim,

MSc student of Operation Management
Lee Kong Chian School of Business
Singapore Management University

IMPORTANT:

If you are a purchasing manager or in related position, please fill in Sections A and C only.

If you are a marketing manager or in related position, please fill in Sections B and C only.

If you are both, please fill in all Section A, B and C.

Start of Section A

Below is a list of statements describing the typical supplier. Please indicate the extent to which you agree or disagree with each of the following statements using the scale as follows:

1	*2*	*3*	*4*	*5*
Strongly Disagree	*Disagree*	*Neutral*	*Agree*	*Strongly Agree*
(SD)	*(D)*	*(N)*	*(A)*	*(SA)*

Statement	SD D N A SA
1. The typical supplier often hinted that they would take certain actions that would reduce our profits if we did not go along with their requests	1 2 3 4 5
2. The typical supplier might have withdrawn certain needed services to us if we did not go along with them	1 2 3 4 5
3. The claims of the typical supplier were viewed by our management team as legitimate	1 2 3 4 5
4. In the past, we have accepted recommendations/suggestions from the typical supplier	1 2 3 4 5
5. The typical supplier exhibited urgency in its relationship with our firm	1 2 3 4 5
6. The typical supplier is active in pursuing their claims and desires	1 2 3 4 5

Below is a list of statements describing supply risks. Please indicate the extent to which the supply risks will impact your firm using the scale as follows:

1	*2*	*3*	*4*	*5*
No Impact (NI)	*Low Impact (LI)*	*Moderate Impact (MI)*	*High Impact (HI)*	*Very high Impact (VHI)*

Statement	NI	LI	MI	HI	VHI
1. Supplier unable to offer competitive prices	1	2	3	4	5
2. Supplier unable to meet quality requirements	1	2	3	4	5
3. Supplier goes into bankruptcy	1	2	3	4	5
4. Supplier's technology is behind competitors	1	2	3	4	5
Others, please specify:	1	2	3	4	5
Others, please specify:	1	2	3	4	5
Others, please specify:	1	2	3	4	5

Below is a list of statements describing supply risk response strategies with regard to <u>typical</u> supplier. Please indicate the extent to which your business unit has implemented it using the scale as follows:

1	*2*	*3*	*4*	*5*
To a Very Small Extent (VSE)	*To a Small Extent (SE)*	*Neutral (N)*	*To a Large Extent (LE)*	*To a Very Large Extent (VLE)*

Statement	VSE	SE	N	LE	VLE
1. Frequent contact with the typical supplier	1	2	3	4	5
2. Supplier certification	1	2	3	4	5
3. Require supplier to produce a business continuity plan	1	2	3	4	5

4. Safety stock planning/ safety time planning	1 2 3 4 5
5. Using multiple sources for the same item	1 2 3 4 5
Others, please specify:	1 2 3 4 5
Others, please specify:	1 2 3 4 5
Others, please specify:	1 2 3 4 5

End of Section A

Start of Section B

Below is a list of statements describing the typical customer. Please indicate the extent to which you agree or disagree with each of the following statements using the scale as follows:

1	*2*	*3*	*4*	*5*
Strongly Disagree	*Disagree*	*Neutral*	*Agree*	*Strongly Agree*
(SD)	*(D)*	*(N)*	*(A)*	*(SA)*

Statement	SD D N A SA
1. The typical customer often hinted that they would take certain actions that would reduce our profits if we did not go along with their demand	1 2 3 4 5
2. The typical customer might have withdrawn certain needed services to us if we did not go along with them	1 2 3 4 5
3. The typical customer had the right to expect us to go along with their request	1 2 3 4 5
4. We had an obligation to do what the typical customer wanted, even though it was not a part of the contract	1 2 3 4 5
5. The typical customer exhibited urgency in its relationship with our firm	1 2 3 4 5

6. The typical customer is active in pursuing their claims and desires	1 2 3 4 5

Below is a list of statements describing demand risks. Please indicate the extent to which the demand risks will impact your firm using the scale as follows:

1	*2*	*3*	*4*	*5*
No Impact (NI)	*Low Impact (LI)*	*Moderate Impact (MI)*	*High Impact (HI)*	*Very high Impact (VHI)*

Statement	NI LI MI HI VHI
1. Customer's demand is uncertain	1 2 3 4 5
2. Customer's demand for a product is short-lived	1 2 3 4 5
3. Customer may default or exhibit bad payment behavior	1 2 3 4 5
Others, please specify:	1 2 3 4 5
Others, please specify:	1 2 3 4 5
Others, please specify:	1 2 3 4 5

Below is a list of statements describing demand risk response strategies with regard to <u>typical</u> customer. Please indicate the extent to which your business unit has implemented it using the scale as follows:

1	*2*	*3*	*4*	*5*
To a Very Small Extent (VSE)	*To a Small Extent (SE)*	*Neutral (N)*	*To a Large Extent (LE)*	*To a Very Large Extent (VLE)*

Statement	VSE SE N LE VLE
1. Price the product in a flexible way	1 2 3 4 5
2. Increase channels for products or service provided	1 2 3 4 5

3. Produce extensions of the current product	1 2 3 4 5
Others, please specify:	1 2 3 4 5
Others, please specify:	1 2 3 4 5
Others, please specify:	1 2 3 4 5

End of Section B

Start of Section C

Below is a list of statements describing activities. Please indicate your likelihood of engaging each activity using the scale as follows:

1	*2*	*3*	*4*	*5*
Very Unlikely (VU)	*Unlikely (UL)*	*Undecided (UD)*	*Likely (L)*	*Very Likely (VL)*

Statement	VU UL UD L VL
1. Approaching my boss to ask for a raise in salary	1 2 3 4 5
2. Betting a week's income at the casino	1 2 3 4 5
3. Not wearing a helmet when riding a motorcycle	1 2 3 4 5
4. Trying out bungee jumping at least once	1 2 3 4 5
5. Passing off somebody else's work as my own	1 2 3 4 5
6. Disagreeing with my boss on a major issue	1 2 3 4 5
7. Voice out my rights in the firm even though a reprimand from superior may occur	1 2 3 4 5
8. I risk the loss of bonus to protect my colleague from a mistake	1 2 3 4 5

Background Information

Please fill in the information or tick the appropriate boxes.

1 Total Working Experience

- ☐ 6 months to less than 1 yr
- ☐ 1-2 yrs
- ☐ 3-5 yrs
- ☐ 6-10 yrs
- ☐ 11 yrs or more

2 Working Experience in the organization

- ☐ 6 months to less than 1 yr
- ☐ 1-2 yrs
- ☐ 3-5 yrs
- ☐ 6-10 yrs
- ☐ 11 yrs or more

3 Position in Organization

- ☐ Top level
- ☐ Upper Middle Level
- ☐ Middle
- ☐ Lower Middle Level
- ☐ Junior Level

4 Age

- ☐ 18-20 yrs
- ☐ 21-25 yrs
- ☐ 26-30 yrs
- ☐ 31-39 yrs
- ☐ 40-49 yrs
- ☐ 50 yrs & above

5 Gender

- ☐ Male
- ☐ Female

6 Industry

- ☐ Food and beverage
- ☐ Electronics and electrical
- ☐ Chemicals and pharmaceutical
- ☐ Retail
- ☐ Automotive
- ☐ Manufacturing
- ☐ Logistics
- ☐ Fashion
- ☐ Aerospace

Others, please specify:_____

7 Organization's Gross Revenue

- ☐ $0-10M
- ☐ $10M-$50M
- ☐ $50M-$200M
- ☐ $200M-$500M
- ☐ >$500M

8 Number of Employees

- ☐ <50
- ☐ 50 to 99
- ☐ 100 to 199
- ☐ 200 to 499
- ☐ 500 to 999
- ☐ >1000

End of survey. Thank you for your responses.