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CASE STUDY OF A LEATHER MANUFACTURER.
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SOURCING DECISIONS TO MITIGATE SUPPLY CHAIN

DISRUPTION RISKS:

CASE STUDY OF A LEATHER MANUFACTURER

By

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for the degree of Master of Business Administration

ABSTRACT

Modern supply chains are international, complex, dynamic networks that are subject to uncertainty, vulnerability, large time-lags, and variability in delivery. One of the main reasons that have made supply chain networks more vulnerable is the raise of lean or JIT manufacturing practices. Those approaches are to eliminate all the wastes in supply chains and focus greatly on cost reduction by centralising the assets, reducing the supplier base or decreasing the stocks dramatically. However, the benefits must be weighed and balanced against the future risks of disruptions and costs. Furthermore, since sourcing policy is closely relative to supply chain continuity and security, this study examines how sourcing decisions in one large-scale leather manufacturing organisation could help mitigate supply chain disruption risks, focusing on identifying and examining key factors which have great impact on sourcing decision making processes to figure out the most appropriate sourcing policy for organisations to mitigate supply chain disruption risks.

It is suggested from this study that organisations should examine external and internal potential risks to build a risk awareness culture across the networks and to introduce flexibility for more resilient supply chain networks. Since disruption risks are unpredictable and inevitable, organisations should embrace them and tackle them

properly. Proper preparation before occurrences would mitigate the harm brought along by supply chain disruptions.

In addition, from the research and the case study of Prime Asia Group, it is concluded that (i) sourcing policy and sourcing decisions play a significant role in protecting supply chain against disruption risks; (ii) the essential variables derived from the case study are quite different from what literature proposed. (iii) However, the variables identified and analysed do help decision makers ponder on how to find a more appropriate sourcing policy to mitigate disruption risks after the evaluation of trade-offs.

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CHAPTER 1—INTRODUCTION

1.1 Background

Modern supply chains are international, complex, dynamic networks that are subject to uncertainty, vulnerability, large time-lags, and variability in delivery. The complexity and variability may take place from physical distances. Long distances, especially those from cross-border supply, usually lengthen transportation and order lead times (Stank, 1997) and decrease the reliability of demand forecasts (Ho, 1992). Furthermore, a recent Michigan State University study showed that after years of manufacturers' moving to demand-driven and lean manufacturing or Just-in-Time (JIT) practices, supply chains have become increasingly vulnerable and fragile supply chains (www.purchasing.com). The vulnerability of the supply chains may potentially come from a variety of sources, such as computer hackers with destructive or disruptive viruses and terrorist attacks (www.logisticstoday.com). In addition to the elevated threat of computer hackers and terrorism, Bordner (2003) argued that manufacturing supply chains have the risks from weather, natural or man-made disasters, political instability, strikes, and terrorism attacks. These threats and risks could affect every aspect of the operations, from key components to packaging materials to distribution. When there is little buffer inventory and unfortunately something unexpected goes wrong in supply chains, the consequential disruptions

could have a rapid and significant impact on the firms. Therefore, inventory planning incorporated with the consciousness of expected and unexpected risks is crucial in supply chain managements.

Inventory planning in supply chain management is all about uncertainty. How uncertain it could be was revealed after September 11, 2001, terrorist attacks in U.S.A. Delays at border crossings resulted in temporary factory shutdowns, and limited air-cargo flights hurt perishable-goods retailers (Aichlmayr, 2001). Since 9/11 terrorism, organisations have become more aware of the vulnerability of their supply chains and are forced to confront inherent risks and to increasingly emphasise on supply chain security. However, most organisations are confused with the ways how to manage risk disruptions in supply chains. Firstly, there is no simple answer in crafting strategies under uncertainties. Second, with manufacturers' new awareness of risks and uncertainties associated with lean supply chains, organisations have to be more flexible for new contingencies and examine their supply chain designs in light of new trade-offs (Aldred, 2003). Lately, organisations recognise the costs resulted from risk management but have a rigid time distinguishing tradeoffs between agility on one side and complexity on the other side (Prater et al., 2001) and the tradeoffs between benefits and costs in supply chain management.

1.2 Aim of the Study

As mentioned previously, one of the main reasons that have made supply chain networks more vulnerable is the introduction of lean manufacturing practices. Those approaches are designed to eliminate all the wastes in supply chains and focus greatly on cost reduction by centralising the assets, reducing the supplier base or decreasing the stocks dramatically. Martha and Vratimos (2002) estimated that by using JIT techniques, inventory carrying costs in the automotive industry alone had been saved more than \$1 billion a year in the past decade. Therefore, it would be absurd for organisations to completely abandon those practices. However, the benefits must be weighed and balanced against the future risks of disruptions and costs. Adjustments need to be made, particularly when organisations consider the better alternative of single or multiple sourcing policy since sourcing decisions are relative to supply chain disruption risks, and supply chain continuity and security. Therefore, this study examines how sourcing decisions in one large-scale leather manufacturing organisation could help mitigate supply chain disruption risks, focusing on identifying and examining key factors which have great impact on sourcing decision making processes. The chosen organisation has been searching for various options to cut down costs and eliminate wastes in supply chain management, such as lean practices, and meanwhile increase efficiency and quality. Despite the benefits resulted from lean

manufacturing practices, there is likelihood that lean practices may give rise to elevated disruption risks in supply chains. As a result, the objective of this study is to identify essential variables for better alternatives of sourcing strategies for this leather manufacturing organisation to examine its supply chain design in light of new tradeoffs between benefits, costs, disruption risks, and complexity. Meanwhile, this study is to examine whether the better sourcing alternative and lean practices or JIT manufacturing recommended from literatures are suitable for leather manufacturing industry.

The thesis focuses on identifying and evaluating essential variables which are affecting sourcing decision making processes, trying to find a better alternative of sourcing policy for this leather manufacturing organisation to protect its supply chain against disruption risks so as to obtain and sustain competitive advantages through supply chain management.

1.3 Structure of the Study

This study comprises five chapters. Chapter one illustrates the motives and the aims of this study. Chapter two focuses on the literature review which is relative to this study, and it contains (i) the domain of supply chain management and its definition,

evolution, significance and challenges; (ii) how to manage uncertainty in rapidly changing environments for effective supply chain management as well as the four levels of uncertainty, uncertainty analysis tools and alternative strategies which are defined and suggested by Courtney (2001); (iii) how to manage supply chain disruption risks, including the risks resulted from volatile demand and uncertain environment, the possible solution from both agility and leanness strategies, the significance of hedging supply chain disruption risks, and the disruption failure mode conducted by Sheffi et al. (2003); (iv) the choice of sourcing strategy—single and multiple sourcing approaches, which covers six choices of sourcing strategy in literature, the benefits and drawbacks of single and multiple sourcing, the significance and risks of sourcing decisions, and the essential variables for adoption decision making processes.

Chapter three demonstrates the methodology adopted in this study, starting from the discussion about why qualitative research method is preferred and more appropriate for this study, and then followed by the sources of data and the brief background of the chosen case study organisation. Furthermore, it clearly displays the flow of the research processes and shows Quayle's (2002) Analytical Framework for Sourcing which is utilised to group the essential variables obtained from active interviews of

eight top decision makers in the case study organisation for further analysis and recommendations. In order to utilise Quayle's framework to obtain essential factors for the study, and to make a neutral stance on the result, the research questions and the limitations of chosen method are indicated in the end of this chapter.

Chapter four illustrates general findings on sourcing policy and purchasing management and the essential variables of sourcing decision making processes obtained from interviews. It then focuses on the significance of the variables of sourcing decisions for better supply chain management to mitigate disruption risks.

Chapter five starts with the implications for economists, marketing, purchasing, and management. It then indicates the recommendations to build a more resilient supply chain for leather manufacturing industry and the recommendations for future research.

This chapter then finishes with the conclusions obtained from both literature review and the case study.

CHAPTER 2—LITERATURE REVIEW

2.1 Supply Chain Management

Supply chain management (SCM) remains an issue of substantial interests among supply practitioners and academicians. This is evidenced in the wide range of perspectives and theoretical frameworks found in journals and books on the topic (Larson and Halldorsson, 2002). A brief review of recent literature on SCM demonstrates that it is a complex and challenging task owing to the recent business trends of broadening product variety, short product life time, increasing outsourcing, globalization of businesses, and continuous advances in information technology. Moreover, the recurring themes in recent academic publications are customer-supplier alliances, lean and agile manufacturing practices, supply chain risk management, sourcing policy, logistics, and supplier partnership management. Other repeatedly referred to themes contain strategic planning, information and communication systems, e-business, organisational design and change management, inventory management and planning and control systems, performance assessment, decision support systems and reverse and environmental logistics (Power and Dapiran, 2000). With the whole range of activities of SCM, from the beginning to the end of processes, Lee (2002) argued it has emerged as one of the major areas for firms to enhance and sustain a competitive advantage. To be in the possession of the ability to manage

supply chain well and add value to it in achieving the competitive advantage, many firms have not yet mastered and it itself is a complex and challenging task (Davis et al., 2003).

2.1.1 The Evolution of SCM

The supply chain concept is presented variously as encompassing vertical chains, networks, collaboration, trust and openness, logistics, value adding, flexibility, e-business and applications of information technology. The multifaceted nature of the SCM concept reflects both the complexities of the supply chain and today's multi-dimensional management paradigms. Inter-company relationship building and networking are viewed as essential supply chain activity by a number of authors (Petrovic-Lazarevic et al., 2004). In the 1970's, it was evident that the customer "pull" was more crucial than supplier "push". This change of attitude was further hastened by the emergence of new Japanese management techniques (Metcalf, 2004). Leenders and Fearon (1997) defined SCM as "a systems approach to managing the entire flow of information, materials, and services from raw materials suppliers through factories and warehouses to the end customer." Monczka, Trent, and Handfield (1998) defined SCM as "an organizational concept whose primary objective is to integrate and manage the sourcing, flow, and control

of materials using a total systems perspective across multiple functions and multiple tiers of suppliers.” Christopher (1998) defined SCM as “management of upstream and downstream relationships with suppliers and customers to deliver superior customer value at less cost to the supply chain as a whole.” Skjoett-Larsen’s (1999) definition of SCM focused on development of teamwork with common vision and similar long-term objectives, and development of an information system that leads to trust and openness between parties. Cox (1999) defined SCM as networks of organisations in delivery channels and it produces value for customers, and contributes to achieving and sustaining a competitive advantage. Christopher and Towill (2000) further discussed SCM in terms of collaborative relationship management, procurement and logistics effectiveness and efficiency at the operational level and stressed the growing importance of adding value through speed, flexibility and e-business.

From the supremacy of the manufacturers and wholesalers to the emphasis on customers nowadays, supply chain has undergone a shift in its operation. The commencement of the ‘century of the consumers’ would make supply chain management a challenging task to the organisations since customer behaviour is changeable, assertive and unpredictable (Blackwell and Blackwell, 1999). Due to

the uncertainty of consumer behaviour, it is a challenging task for the organisations to ponder on how to tackle the challenge to function their supply chain accordingly under the trend and situation.

Seeing that consumer behaviour is unpredictable in swiftly shifting environments, the focus has been switching to the external integration of the numerous and various partners in supply chain in order to establish a synergistic, long term, and mutually beneficial relationship on the rise of intensive competition (Johansson, 2002). This evolution has also been ripe for a 'super supply chain management' where functions, such as product development, marketing and customer service are built-in (Metz, 1998). Furthermore, there are growing interests in organisations' agility analysis in supply chain management, in that agility is deemed a collaborative attribute that could reinforce the supply chain so as to ensure organisations against varying environments or enhance organisations' sustained success. According to Fisher (1997), new concepts of flexible manufacturing, automated warehousing, and rapid logistics, such as quick response, efficient and accurate consumer response, mass customization, lean manufacturing, and agile manufacturing, offer models for applying the new technology of electronic data interchange to improve supply chain performance.

In addition to the interests of these new concepts, the interest of supply chain risk management in supply chain management has increased in purchasing, logistics and supply chain management research (Hallikas et al., 2000; Lambert and Cooper, 2000; Souter, 2000; Johnson, 2001; Lamming et al., 2001; Mentzer et al., 2001). Christopher and Lee (2004) argued that a supply chain with high risk exposure cannot be efficient. The complexity and uncertainty within a supply chain could increase the chaos risks within the supply chain and these increased risks could lead to higher costs and inefficiencies. For example, the famous “bullwhip” effect (Lee et al., 1997) is an example of the chaos. Moreover, unexpected and unpredicted disruptions could add to the risks of a supply chain. Norrman and Jansson (2004) argued that supply chain risk management is progressively more essential as the vulnerability of supply chains increases. Kilgore (2004) further suggested that an analytical risk management coupled with strategic and tactical analyses could shrink overall costs, avoid disruption, and better balance capacity and demand.

2.1.2 The Significance of SCM

Supply chain management is crucial because various levels of supply chain performance would determine the success or failure of organisations. A major

feature of contemporary business is the thought that it is supply chains that compete, not companies (Christopher, 1998). Metcalfe (2004) argued that successful supply chain management could achieve significant cost savings and other benefits, for it offers improved planning to reduce waste and shorten timeframes, better information to understand customers and the market, better communication and relationships to improve quality, build trust, decrease response times, and enable organisations to work together to achieve greater innovation and responsiveness to the marketplace, and better information to minimise inventory holdings and to minimise bottlenecks, and increase efficiency throughout the supply chain. More specifically, revenue could be increased due to corresponding reduction of cost and working capital resulted from its lower level of inventories of raw materials, finished goods, and fixed capital (Evans and Danks, 1998). According to a study by Accenture, Stanford University, and INSEAD on how companies utilise supply chain management to drive competitive advantage, strong supply chain performance results in a large reward with a premium of 7 to 26 percent in the growth rate of market capitalization (Copacino, 2003). In addition, Waller (1999) suggested that building up superior relationship with suppliers and customers would bring about a financial value by means of no build-up of excess inventories. Thus, the products or services are furnished to the

customers and the just-in-time manner without incurring additional cost in unsold stock would be achievable. Working in intimate partnership with suppliers and customers would also enable organisations to turn competition into coordination and collaboration. Making this leap requires a great deal of trust and respect. Partners need to share new-product introduction plans, sales forecasts, production schedules, and shipment plans on a real-time basis so that changes in the marketplace could be integrated rapidly into the supply chain. With the sharing information among business partners, a price war could be avoided and better customer retention could be achieved due to quicker response time, improved quality and efficiency in the processes across collaborative supply chain network (Dunne, 2000). Vidyarthi and Dutta (2001) also argued that well-built supply chain management is able to integrate various functional entities to achieve the shared objectives of lowering the costs of production, enlarge and solidify customer base, and dominate a wider market. Eventually, collaborative supply chains management would effectively support superior brands and technology into the market (Anderson and Delattre, 2002). Therefore, in view of the great interests of SCM among academic researchers and practitioners, and the significance of SCM, organisations are suggested to prudently emphasize on and evaluate their supply chain management so as to stay ahead the intensive competition in the

market. However, effective supply chain management is a challenging task due to its complex and uncertain traits.

2.1.3 The Challenges of SCM

Supply Chain can be large, highly volatile and recursive in nature because it involves multiply modes of transportation, customs, payment terms, currencies, languages, time zones, and even transit times. It is proposed that the potential for instability is inherent in the supply chain because of the possible occurrence of the unpredictable delays and multiple feedback and feed forward loops. In addition, the convergence of fundamental manufacturing trends, escalating complexity and increasing urgency is forecasted to carry on (Bal et al., 1999). As mentioned in the significance of supply chain management, working intimately with partners across supply chain network could build goodwill, streamline operations and cut off expenses. Ideally, a good partnership will take supply chain demand planning to a new level of efficiency and profitability. However, wrong partnerships could cost more through burning up profits, wasting valuable staff time and even through damaging long-term business prospects (Zieger, 2003). Morgan (2003) also argued that few organizations have considered thoroughly the implications of constructing and implementing trans-company performance measures to evaluate

the performance of partners across the supply chain. Therefore, selecting, developing, and evaluating long-term beneficial partnerships in supply chain management is a challenging future task. In addition, cultural differences should be considered in the performance measurement across international boundaries, or it is likely to result in serious problems in the long run.

Another challenge comes from customers whose needs and demands are changing and no longer predictable, yet who expect quick-response from manufacturers (Anon., 1999). The attitude of customers with their varying demands would affect a successful supply chain management. Over the past few years, organisations have invested a large fortune in ERP to improve the flow of information and control throughout the organisation so as to drive cost out of the supply chain, reduce lead times, and ensure better customer service. The impetus to tailor the processes by reengineering the operations in response to changing customer needs and demands would result in continuous pressure of improvements which could exhaust any organisations. The challenge here is whether they have sufficient resources to continue the task and how organisations could balance between the benefits and the risks of losing competition. However, it has long been recognized that effective information flow is crucial for an efficient supply chain. For

successful supply chain management, a continuous sharing of information by means of technology, which requires fundamentally the existence of trust and respect, is a must (Bal et al., 1999). With collaborative efforts, costs could be reduced, responsiveness could be heightened, but since the information sharing is across a network, competitors could also have access to the information and exploit organisations' innovative and competitive advantages (Kopczak and Johnson, 2003). The dilemma of information sharing has no solution in sight since restricting the information flow with others would not be achieved effectively and agreeably in the spirit of good partnership.

In addition to the challenge of information sharing through technology, Mason-Jones et al. (2000) argues that supply chain management is actually to deal with 20% technical issue and 80% people issue. This brings along the examination of human resource management and cultural scrutiny in the organisations. With the introduction of technology and its impact to the operations, human factor is essential to successful preparation for the changes in supply chain management. Continuously and comprehensively communicating with staff, such as training programme, would be a good beginning of preparation when facing challenges. However, Johnson (2002) argued that keeping employees up to date with today's

new technologies through training is always a daunting challenge. Diversification across geography, age, backgrounds, attitude, and skill sets would increase the complexity and difficulties required of training programme. Bal et al. (1999) also suggested that one of the barriers to direct human interaction in the supply chain is the geographical separation of its partners. A virtual team could improve the flow of information, quickly sharing knowledge and expertise, regardless of location. Furthermore, Lowe and Markham (2001) found that the practice of empowerment and team activities, factored in a robust human resource programme, could offer a possible solution to this people-oriented predicament. However, the human factor in supply chain management remains a challenging task.

Since supply chain integration requires not only the coordination from forecasting, planning and scheduling, but also the coordination of all the key partners across the supply chain network, reducing or eliminating Bullwhip effect, the phenomenon of variability magnification moving from the customer to the producer defined by Chase et al. (2004), could help reach supply chain integration. To be more precise, the challenging task is to design and operate integrated supply chains with shared benefits from high performance for all partners across the network, and to obtain a win-win situation. Once the Bullwhip phenomenon is

eliminated, it is suggested that there is 10-30% increase in profitability (Metters, 1997), and problems resulted from labour management, inventory control, and excessive administration would be tackled (Taylor and Bjornsson, 1999).

2.2 How to Manage Uncertainty

In the past couple of years, the business environment has become increasingly complex and unpredictable, speedily changing and extremely uncertain. Organisations are struggling to stay ahead in this uncertainty so as to maintain or gain a competitive edge. Effective supply chain management has emerged as one of the major areas for organisations to gain a competitive edge, though it is a complex and challenging task. Due to the current business trends of expanding product variety, short product life cycle, increasing outsourcing, globalization of businesses, and continuous advances in information technology, managers cannot rely any more on outdated “tried-and-true” approaches or a one-size-fits-all strategy (Lee, 2002). Courtney (2001) suggested roadmaps to help managers to embrace uncertainty and define adapted strategies. First of all, managers should adopt a new mindset to exploit uncertainty by stopping avoiding uncertainty, but facing it and even utilizing it. In this way, organisations could contrarily exploit and benefit from it and constantly look for new opportunities to gain competitive advantage. Courtney (2001) further defined four levels of

uncertainty for managers to consider what the level of uncertainty is so as to determine strategic issues at stake. The four levels defined by Courtney (2001) are shown as follows:

Level 1: the lowest level of uncertainty which is so low that the traditional forecasting methods could be used successfully.

Level 4: the highest level of uncertainty which could not bound the possibilities within the range, let alone the traditional forecasting methods.

Level 2 and 3: the levels of uncertainty between the two extremes of level 1 and level 4 which are most likely being faced by organisations. In level 2, managers could 'identify a set of distinct possible outcomes'. In the level 3 of uncertainty, managers can 'bound the range of possible outcomes'.

Organisations must determine the level of uncertainty they are facing and choose the strategy accordingly. Once the level of uncertainty is determined, it would help organisations to frame the most adapted strategies. With a list of possible solutions, organisations need to analyze all the possible solutions and bring up the best strategic choices. Courtney (2001) suggested the analysis tools, including decision trees, scenario planning exercises, game theory, real options, system dynamics, and management flight simulators, in the changing and uncertain environment, instead of traditional analysis framework, such as SWOT analysis, Porter's Five Forces, and Discounted Cash Flows. After the most suitable strategic choice is selected according

to the level of uncertainty, implementation is the following challenging task. It is proposed that under uncertain environment, it is necessary to monitor and modify the strategies over time. In addition, alternative approaches, such as contingent road maps, option portfolio management and strategic evolution, are recommended by Courtney (2001) to tackle the uncertainty in rapidly changing environment.

2.3 How to Manage Supply Chain Disruptions

As today's marketplace is characterised by turbulence and uncertainty, recent events have generated the interests in the threat that a supply chain disruption poses to global organisations. The greater the uncertainties in supply and demand, market globalization, increasingly shorter product and technology life cycles, and the increased global manufacturing, distribution channels and logistics partners resulting in complex international supply network relationship, have led to higher exposure to risks in the supply chain (Elkins et al., 2005). It is suggested that not only the impact of external events such as wars, terrorist attacks or strikes, but also the impact of changes in business strategies internally, such as lean practices, the move to outsourcing and a general tendency to reduce the size of the supplier base, would impose disruption risks upon supply chain (Christopher and Lee, 2004). A rich literature deals with the general issue of supply chain risk management but focuses

most on volatile demand and uncertainty in the market. Articles in this domain suggest that the key to survive in such context is by means of agility, which is defined as “the ability of an organization to thrive in a continuously changing, unpredictable business environment” (Agility Forum, 1994). Towill and Christopher (202) further brought out the “Leagile” principle as one particular way of exploiting both leanness and agility to tackle supply chain risks under complexity and uncertainty. However, Prater et al. (2001) argued that the introduction of factors that could increase supply chain agility and leanness may increase supply chain uncertainty and complexity in certain circumstances.

Since 9/11 terrorist attack in U.S.A., organisations and researchers are more aware of the significance of such uncertainties. More researchers tried to include the notion of disruption and uncommon event-related risks in the articles as organisations have seen their supply chains weakened by such risks. For example, Ford had to shut down five of its plants due to the disruption from its suppliers in Canada (Aichlmayr, 2001). Some researchers focus precisely on disruption risks and study possible solutions that organisations should consider to obtain securer supply-chains or to mitigate the consequences of disruption. Coutu (2002) defined resilience, which could provide organisations with valuable insights into disruption risks, as “the ability to bend and

bounce back from hardship”. Elkins et al. (2005) suggested 18 best practices for protecting the supply chain against disruption (please refer to APPENDIX A). Moreover, according to the result of the interviews conducted, none of the companies has put in practice all of these supply chain risk management best practices. However, there is definitely a new consciousness of the need to develop better risk management capabilities and responsibilities for building supply chain resiliency and responsiveness (Elkins et al., 2005).

Risks that could lead to supply-chain disruptions are beyond the natural catastrophes, strikes, political instability, fires, cyber attacks, bankruptcies, or terrorism. Modern practices such as lean practices and JIT inventory management could make supply chains even more vulnerable (Stamm, 2005). In addition, it is argued that the pressure to enhance productivity, eliminate waste, remove supply chain duplication, and drive for cost improvement has resulted in the key risks factors (Stauffer, 2003). In order to foresee the unexpected to mitigate the risks of disruptions, it is suggested that managers must pay balanced attention on both exceptional events and smaller risks which have a high frequency and could also hurt organisations as much externally and internally.

According to the Supply Chain Failure Modes by Sheffi et al. (2003), six different types of failure modes could be categorized into “Disruption in Supply, Disruption in Transportation, Disruption at Facilities, Freight Breaches, Disruption in Communications, and Disruption in Demand” (please refer to Table 2.1). The number of “failure modes” shown is limited, but these are what matters to organisations in order to evaluate the potential consequences of disruptions.

Table 2.1: Supply Chain Failure Modes

Failure Mode	Description
Disruption in supply	Delay or unavailability of materials from suppliers, leading to a shortage of inputs that could paralyze the activity of the company.
Disruption in Transportation	Delay or unavailability of the transportation infrastructure, leading to the impossibility to move goods, either inbound or outbound.
Disruption at Facilities	Delay or unavailability of plants, warehouses and office buildings, hampering the ability to continue operations.
Freight breaches	Violation of the integrity of cargoes and products, leading to the loss or adulteration of goods (can be due either to theft or tampering with criminal purpose, e.g. smuggling weapons inside containers).
Disruption in communications	Delay or unavailability of the information and communication infrastructure, either within or outside the company, leading to the inability to coordinate operations and execute transactions.
Disruption in demand	Delay or disruption downstream can lead to the loss of demand, temporarily or permanently, thus affecting all the companies upstream.

Source: Sheffi, Y., Rice, J. B., Fleck, J. M. and Caniato, F. (2003) “*Supply Chain Response to Global Terrorism: A Situation Scan.*”

2.4 The Choice of Sourcing Strategies: Single or Multiple Sourcing

It is proposed that there are six possible sourcing strategies for material procurement.

These are (1) single sourcing: buying from one source only; (2) multiple sourcing: buying from more than one source; (3) parallel sourcing: combining single and multiple sourcing; (4) backward vertical integration: buying the source itself; (5) sole sourcing: the result of being forced to buy from one supplier due to the factors such as location, exclusive design rights, customer specifications, and buyer inertia; (6) self supply: making the item or materials yourself (Ramsay and Wilson, 1990; Quayle, 2002). For the purpose of this study, literature on single and multiple sourcing will be considered.

Multiple sourcing is often cited as a possible solution to protect against the disruptions in supply chains. However, the importance of multiple sourcing is diminishing after the introduction of lean manufacturing, JIT manufacturing, or Kanban in 80's, for these approaches allow firms to reduce cost dramatically and gain higher competitiveness in various markets (Spekman, 1988; Pilling and Zhang, 1992).

In particular, many firms have streamlined their supplier base following the example of the Japanese manufacturing firms. Some firms adopted single sourcing, yet some others chose to rearrange the tiers of their supplier network so as to deal with limited

number of main suppliers. According to Mohr and Spekman (1994), single sourcing accomplishes several benefits: (1) there are only fewer suppliers to contact; (2) economies of scale could be achieved because volumes can be consolidated for huge quantity discounts; (3) the chosen suppliers can dedicate capacity to the organisation and reduce order lead time; (4) the logistical cost and complexity of transportation can be reduced. In addition to the benefits of single sourcing, Piaw (2002) further compared the benefits between single sourcing and multiple sourcing as listed in Table 2.2 below.

Table 2.2: The Benefits of Single and Multiple Sourcing Approaches

Single Sourcing	Multiple Sourcing
<ul style="list-style-type: none"> • Get better pricing through higher volumes • Achieve higher quality standards through continuous improvements • Lower costs that are incurred to source, process, expedite and inspect • Increase involvement and have better information • Build stronger and longer-term relationship. • Obtain more influence with the supplier • Reduce lead times • Reduce inventory • Streamline the procedure 	<ul style="list-style-type: none"> • Protect the buyer during times of shortages, strikes or other emergencies • Provide a back-up source • Maintain Competition • Keep a market feeling • Avoid complacency on the part of a single supplier • Meet local requirements for international manufacturing locations • Meet customer's volume requirements • When the technology path is uncertain

Source: Piaw (2002)

In spite of how cost effective single sourcing could be, it happens to be very risky. For example, Land Rover was nearly to fire hundreds of its workers due to the dispute

with its single chassis vendor, UPF-Thomson, which had become insolvent and was forced to claim bankruptcy protection (BBC News, 2002). Ramsay and Wilson (1990) further identified the disadvantages of single and multiple sourcing (please refer to Table 2.3).

Table 2.3: The Disadvantages of Single and Multiple Sourcing Approaches

Single Sourcing	Multiple Sourcing
<ul style="list-style-type: none"> • Increased costs through the absence of competitive pressure-with security may come laziness on the supplier’s part. • Increased supply vulnerability-the cessation of supplies following a strike at a single source of a critical material may swiftly cripple the buyer’s operations. • Reduced market intelligence and thus reduced flexibility—being tied to one source of R&D, the buyer may be slow to take advantage of new technologies. • Impaired supplier appraisal capability—without direct access to comparative performance data on other suppliers, monitoring of a single source becomes difficult and many of the results assume a dubious quality. 	<ul style="list-style-type: none"> • Increase over/undertime, as a result of erratic workload caused by the short planning horizon and the general level of supplier uncertainty • Increased levels of waste, resulting from more frequent set-ups • Increased scrap levels, resulting from more frequent set-ups • Increased buffer stock levels, to cope with uneven demand • Increased fixed cost allocation, as a result of more frequent set-ups • Increased incidence of rework and reject rates, as a result of more frequent set-ups

Source: Ramsay and Wilson (1990)

Moreover, since 9/11 terrorist attack, many experts in supply chain management and purchasing advise firms to consider more flexible sourcing strategies to tackle the unexpected. Lee and Wolfe (2003) suggested a list of possible solutions: (1) develop

multiple supply sources for the same component or input material that will cost effectively to enhance flexibility; (2) create a local supply source; (3) create multiple supply sources with the appropriate manufacturing capacities to build the component when needed; (4) use a supplier with more than one manufacturing site.

From single sourcing and multiple sourcing literatures, there are several concerns proposed for its adoption. The definitions for what constitutes a single source policy are somewhat subjective and dependent on the objective of the study, and the organisation or persons involved (Macbeth, 1994). As a result, sourcing policy definitions may use combinations of variables such as economics, culture, partnerships, quality, and trust (Sako, 1992; Carr and Truesdale, 1992). As for multiple sourcing, the decision is suggested to be influenced by variables such as economics, geography, organisational policy, culture, quality, trust, protection of supply source, price competition, and possibly buyer inertia (Tikkanen, 1998; Harland et al., 1999). In general, these variables may be used in varying degrees to influence the preferences of sourcing policy (Min & Galle, 1991). Arguably, single and multiple sourcing will occur depending on each factor operating in a different way, which in turn will lead to different impact on the key objectives of the organisation, such as lower costs or higher revenues or better strategic position (Quayle, 2002).

Single sourcing has allowed firms to reduce substantial sourcing costs and to improve their relationships with the supplier. However, this approach has serious drawbacks which could cause failure of the firms. Therefore, it is proposed that firms must consider the possible solution of relying on several suppliers cautiously so as to mitigate the risks of disruptions in supply chains. Before firms make a decision on sourcing policy, it is suggested useful to identify key variables which would have impact on decision-making in the organisations and to further comprehend and evaluate the decisions made in an uncertain environment, and take flexibility and quick response into account in supply chain management.

CHAPTER 3—METHODOLOGY

The need to establish general sourcing policy of leather manufacturers to mitigate supply chain disruptions risks is fundamental to the study. Having studied a number of secondary sources on topics such as supply chain management, uncertainty, supply chain disruption risks and single vs. multiple sourcing policy, it was observed that a key area of the literature concerned proper sourcing policy in the organisation. In order to study the current situation to identify the variables which have impact on sourcing policy, it was decided that the most effective form would be the use of qualitative techniques which are top management interviews within an empirical case study company in leather manufacturing industry. This Chapter will discuss the incentives behind the sourcing decision as well as the empirical research processes.

3.1 Qualitative Research

There is no agreed definition of what constitutes a qualitative method although such an approach is often seen as covering an array of interpretive techniques which seek to describe, decode, translate, and to come to terms with meaning (Van Maanen, in Cassell and Symon, 1994). In general, qualitative methods are more appropriate when the purpose of researchers is to focus on an organisational process as well as the outcomes, and to comprehend individual work experiences. Moreover, the researchers

carry out the study in natural settings where the employees in the organisations are the participants in the research rather than the subjects of the research (Cassell and Symon, 1994). According to Mason (2002), qualitative research interview is considered as *‘an appropriate and practical way to get at some of what qualitative researchers see as the central ontological components of social reality’* (p. 59). Cassell and Symon (1994) also suggested that the qualitative research interview is preferably suitable for exploring topics where different levels of meaning are needed to be explored. Furthermore, an interview is to utilize the dynamic interplay between the interviewer and the interviewee to make reveal both the substance and processes of meaning-making in relation to research objectives. Also, the background knowledge of environments relevant to the research topic or the respondent’s experience can be an invaluable resource (Holstein and Gubrium, 1995). Therefore, for this study, it was decided that the most appropriate method would be semi-structured interviews with open ended questions, instead of the use of structured interviews which are with closed questions, whereby respondents are confined to the answers offered. In order to achieve the semi-structured nature of the interviews, the questions were conducted in advance according to the on-site visits experiences. Nonetheless, other related and constructive aspects from literature will also be discussed in the study. With the chosen method, participants would expand on the

questions which were of particular concerns and interests. This would enable the researcher to gain deeper perspectives on the topic of the study.

3.2 Sources of Data

In this study, Prime Asia Leather Corporation China Branch was selected as main sources of data. Key respondents from top management in the company provided data by means of interviews with open-ended questions about the sourcing activity within the organisation. This data was purchasing expenditure as a percentage of sales, annual purchasing expenditure, number of suppliers, the percentage of single, dual, and multi-sourcing, the usage of JIT, development supplier relationships, and domestic purchasing policy, which led to an investigation as to why the case study company adopted single or multiple sourcing.

Having established the profile of the company, second interviews seeking the data about sourcing decisions were formulated. The interviews were conducted again with the same respondents who participate in sourcing policy decision-making. Data was provided about the sourcing situation, the characteristics of the materials, market conditions at the time of the review, the factors affecting the sourcing decision, and purchasing profile.

3.3 Company Overview

Prime Asia Leather Corporation (“PALC”) is chosen as a case study for the discussion of the above mentioned strategic operations management issues. In 1996, PALC was incorporated as a joint venture between Pou Chen Group and Prime Tanning Co, Inc., an international leather manufacturing company in the United States. PALC commenced business on Jan 1, 1997, and Pou Chen Group acquired all the shareholding in March, 2002. Now, it is a wholly owned subsidiary of Pou Chen International Group, specialises in manufacturing and developing natural cowhide leathers. Prime Asia has more than 300 kinds of leather products, supplying a variety of high quality leather to the top brands of sporting shoes and casual shoes, such as Nike, Reebok, New Balance, Timberland, Rockport, K-swiss, Adidas, Clarks...etc.

Its headquarters is located in the United States and currently adopts a centralised purchasing management system for its raw materials of ‘wet blue’, which are semi-processed cow skin (technically referred to as *hide*) for shoe leather making, mainly from United States, Brazil, Argentina, Australia, and other countries around the world, and transports them to the branches located in Taiwan, China, and Vietnam. However, for the purchasing of chemicals, which are essential materials when processing ‘wet blue’ to finished leather, it is managed regionally by each branch company in different countries. Stable and consistent raw materials supply is the most

critical factor for the company to survive in the highly competitive market. Therefore, the risks of unpredictable supply disruptions arising from unexpected events, such as natural disaster and cattle diseases, have to be hedged or managed.

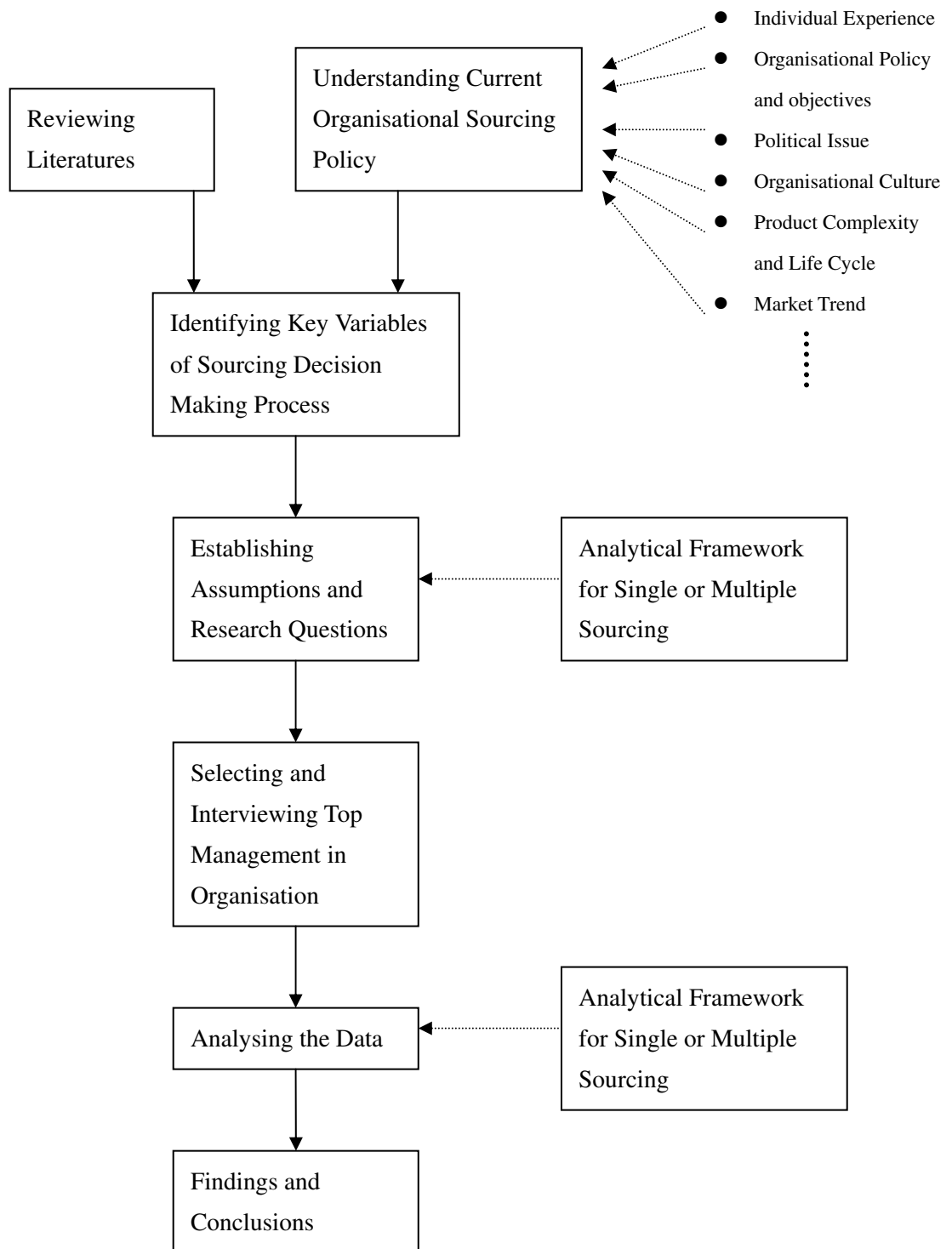
Current raw materials sourcing policy of Prime Asia Group is global multiple sourcing policy because it is proposed that multiple sources of suppliers in different countries could lead to cost efficiency as well as risk diversification in the face of unforeseeable events which would result in problematic situations. However, under the influence of lean or JIT practices, Prime Asia is currently devoted to downsize its supplier base so as to obtain cost benefits. The details of existing sourcing policy would be discussed further in Chapter four. However, the prevailing approaches of lean manufacturing or JIT manufacturing practices in the past decades have made organisations in various industries reduce their supplier base toward single sourcing policy for the purpose of cost or stock reduction. Therefore, the reason for carrying out the study within Prime Asia is to identify essential variables which have great impact on sourcing decision making processes in leather manufacturing industry and to generate data through active interviews as a method of analysing the incentives behind current multiple sourcing policy regardless of the persuasive advantages of lean or JIT manufacturing practices.

3.4 Analytical Framework

The process flow path diagram in Figure 1 indicates the general outline of this study.

From literature review, there is no one accepted way to define the sourcing decision making processes. Cox (1999) argued that strong interaction exists between the attitudes to and perceptions of sourcing policy, and the purchaser's sourcing choices and purchase behaviours in industrial markets. However, the factors affecting the sourcing choice are complex and multi-dimensional. Organisational sourcing policy is only one of the variables affecting sourcing decisions. Factors such as individual experience, organisational objectives, political issue, product complexity and organisational culture would also have impact on organisational sourcing decisions. Ramsey and Wilson (1990) and Seshadri et al. (1991) both proposed that single and multiple sourcing strategies have their advantages and disadvantages and that neither of them clearly dominated. Therefore, it is assumed that purchaser behaviour and influence are also complex and multi-dimensional and is subject to the changing environments.

Figure 1: Processes Flow Diagram

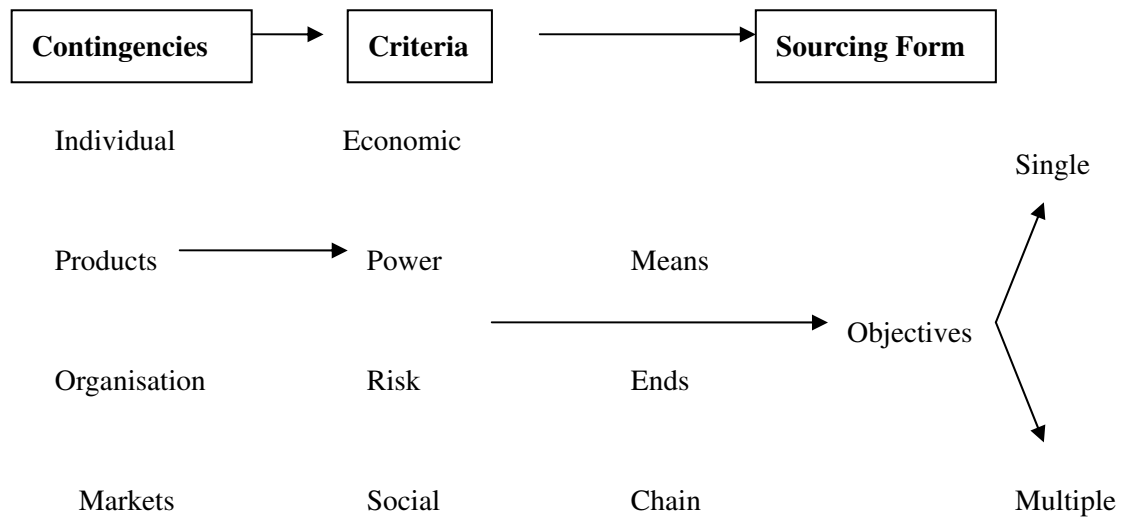


Key variables of sourcing decision making processes are complex since the decision appeared to affect and be affected by the buyers' power and perceptions of products.

These product perceptions are found to be further influenced by many product traits, such as strategic value, quality, service, risk, price, and cost benefits (Bozarth et al., 1998). Other influences on sourcing decisions were reported to contain socio-demographics, attitudes, the two-way relationship of supplier and buyer, inventory reduction, reduction of administrative costs, protection or creation of markets, and preferences. These perceptions and preferences influenced buyers' purchase behaviours (Ramsay and Wilson, 1990).

Nonetheless, Quayle (2002) proposed that there are eight broad groups of variables, which hypothetically may influence the sourcing decision, and these are individual, organisation, product, market, power, social, risk, and economics. Furthermore, an analytical model by Quayle (2002) outlined in Figure 2 would be utilised as the analytical framework for research questions designs and interview data analysis.

Figure 2: Analytical Framework for Sourcing



Source: Quayle (2002)

3.5 Research Questions

The overall aim of the study is to identify essential variables of sourcing decision making processes in leather manufacturing industry, for hypothetically an appropriate organisational sourcing policy would mitigate the disruption risks in supply chain in rapidly changing environment. The research questions are developed to achieve this aim as well as to the literatures about uncertainty, disruption risks, sourcing policy and decision making processes, which are reviewed throughout chapter two.

- Question one: How does the organisation determine the level of uncertainty before deciding on the sourcing policy in the supply chain management so as to mitigate supply disruption risks?

Question one was aimed at determining whether the level of uncertainty is considered into sourcing strategy adoption. Courtney (2001) suggested that organisations should adopt a new mindset to exploit uncertainty by stopping avoiding uncertainty, but facing it and even utilizing it. In this way, organisations could contrarily exploit and benefit from it and constantly look for new opportunities to gain competitive advantage. This could identify the organisation's attitude toward uncertainty and further help the organisation identify and consider the essential factors relative to sourcing decisions in supply chain management so as to lower down the likelihood of disruption risks.

- Question two: Does the organisation have alternative approaches for the disruptions of supply so as to tackle the unexpected disruptions in rapidly changing environment?

According to the result of the interviews conducted by Elkins et al. (2005), none of the companies has put all these best practices of supply chain risk management in practice. Furthermore, it is proposed in Elkins et al.'s 18 best practices that organisations should produce a detailed disruption-awareness plan or a business-continuity plan. There is definitely a new consciousness of the need to

develop better risk management capabilities and responsibilities for building supply chain resiliency and responsiveness. Therefore, question two is designed to find out whether the organisation has any alternative approaches at stake for supply chain management.

- Questions three: What are the factors resulted in supply disruptions internally and externally?

It is suggested that not only the impact of external events such as wars, terrorist attacks or strikes, but also the impact of changes in business strategies internally, such as lean practices, the move to outsourcing and a general tendency to reduce the size of the supplier base, would impose disruption risks upon supply chain (Christopher and Lee, 2004). Therefore, question three is aimed at listing all the possible factors that could result in supply disruption so as to figure out all possible solutions to tackle disruption risks through sourcing decisions.

- Question four: What kind of sourcing policy does the organisation currently adopt? What are the benefits and drawbacks? What are the concerns in sourcing decision making processes?

Since Mohr and Spekman (1994), Piaw (2002), and Ramsay and Wilson (1990) successively identified the benefits and disadvantages of single and multiple sourcing strategies, question four is simply designed to recapture this organisation's concerns about its current sourcing policy and what are the benefits and drawbacks from decision makers' statement.

- Question five: What are the selection criteria for choosing suppliers and how does the organisation review its performance? What other factors would influence the decision on supplier selection?

From single sourcing and multiple sourcing literatures, there are several concerns proposed for its adoption. Sako (1992), Carr and Truesdale (1992), Tikkanen (1998), and Harland et al. (1999) identified combinations of variables which would influence organisational sourcing policy, such as economics, culture, partnerships, quality, trust, geography, organisational policy, protection of supply source, price competition, and possibly buyer inertia. Furthermore, it is proposed that these variables may be used in varying degrees to influence the preferences of sourcing policy (Min and Galle, 1991). Therefore, question five concerned about whether these variables exist in the case study organisation, and how combinations of variables would affect organisational

sourcing decisions. Moreover, how the organisation could utilise the essential variables identified in this study to lower down or prevent its supply of raw materials from disruption risks.

3.6 The Limitations of Chosen Method

Choosing a qualitative research method for this study could be regarded as an extremely exploring and interesting method. However, it is generally suggested that further research on more companies in the same or similar industries is required in order to make generalisations about the variables affecting sourcing decision making processes and how to comprehend these variables identified to obtain the suitable organisational sourcing policy for disruption risk hedge. In this study, it was based on one leather manufacturing organisation which has branches in Taiwan, China, and Vietnam. Whilst detailed observations about the sourcing decision in this organisation were made, it would be unrealistic to consider the study entirely representative. In addition, Yin (2003) further suggested that case studies are not a representation of a sample. Instead of enumerating frequencies (statistical generalisation), expanding and generalising theories (analytic generalisation) is the researcher's goal.

As for the limitations of the open-ended question method, it contains variance in level

of details offered and the skipping of the interviewee to issues of primary concern as apposed to completely addressing a question. Moreover, data-collection time constraints and goodwill concerns prohibited prolonged interviewee follow-up.

Regardless of the limitations in qualitative research method, case study method, and open-ended question method, the post coding of the responses and the credibility of the buyers' responses are other limitations. The post coding of the responses would be influenced and decided arbitrarily by the interpreter whose past experiences, information and knowledge are affecting the interpretation. Finally, even though the research questions designed from literature review and the understanding of sourcing decision making processes, there could still be other factors being undiscovered in the literatures.

It is hoped that this study will fill up a gap in the research by shedding some light into the area about the understanding of better sourcing policy in leather manufacturing industry where of little interests from researchers.

CHAPTER 4—FINDINGS AND ANALYSIS

In addition to the brief background and current sourcing policy of the case study—Prime Asia Group, presented in Chapter three, the core issues of this chapter is to examine the existing sourcing policy and the purchasing procedure of the raw materials—‘wet blue’ and Chemicals in more details, and to identify all possible factors derived from the interviews among the top management, using the Analytical Framework for Sourcing—a Contingency and Criteria Model by Quayle (2002). This chapter would then be proceeded with the elaboration of the most significant variables in detail. With the knowledge of all the significant factors which are affecting the sourcing decisions in Prime Asia, the implications of the finding would then be discussed for leather manufacturing industry so as to obtain managerial implications about how to manage supply chain more efficiently and effectively, and how to evaluate a better alternative of sourcing policy to protect supply chain against disruption risks.

4.1 Findings on Sourcing Policy and Purchasing Management

Based on the results from the interviews with eight decision makers, who are managers, senior managers, vice-president, and general manager from Production Department, Technical Department, Logistics Department and Administration

Department, firstly, it is found that the level of uncertainty and possible risks are not considered into sourcing strategy adoption since the risks derived from uncertainty are difficult to be quantified and the consideration of uncertainty and risks is not persuasive in the process of sourcing decision making. Though Courtney (2001) suggested that organisations should adopt a new mindset to exploit uncertainty by stopping avoiding uncertainty, facing it and even utilizing it, Prime Asia Group never has the risk awareness culture which could be read from its attitude toward uncertainty. Furthermore, the attitude toward uncertainty does help the study to identify the essential factors relative to sourcing decisions for hedging disruption risks in supply chain management.

Secondly, linking back to research question two, Prime Asia has alternative approaches for the unexpected disruption of supply. These alternative approaches are mainly (1) modifying chemical formula to replace the chemicals which are disrupted; (2) changing transportation from ocean shipment to air shipment; (3) finding substitute suppliers. However, these alternatives are simply the remedies after the occurrence of the disruptions. By strictly evaluating these so-called alternative approaches, they are only contingency plans after crisis. Moreover, these alternatives would cost the organisation resources, time, and even coming new orders. Therefore,

the organisation would utilise the 18 best practices for supply chain risk management proposed by Elkins et al. (2005) to produce a detailed disruption-awareness plan or a business-continuity plan to mitigate the disruption risks in the supply of raw materials. Since the first step of these 18 best practices is 'screen and regularly monitor current and potential suppliers for possible supply chain risks', it is suggested that all the existing and potential factors that could give rise to supply disruption be listed and analysed.

Relating this to research question three, the fish bone in APPENDIX B identifies all the potential internal and external factors which would have the impact on supply disruptions. This is linked with the literature that internal and external factors within supply chain would impose disruption risks upon supply chain (Christopher and Lee, 2004). However, this study focuses on the aspect of how internal and external factors influence sourcing decisions which have relations to disruption risks.

As for research question four, the existing sourcing policy for both 'wet blue' and Chemicals is multiple sourcing strategies, for the objectives of risk diversification, as mentioned in Chapter three. According to the statement from interviews, even though JIT and Lean practices have been bringing an unprecedented trend to manufacturing

industry, single sourcing derived from JIT and lean practices is not suitable for the sourcing policy in leather manufacturing industry, mainly due to the nature of the raw materials—‘wet blue’ and Chemicals. As for ‘wet blue’, it is natural semi-finished products and the quality depends heavily on regional climate, diseases, and plant ecology. Furthermore, the standard of ‘wet blue’ quality inspection is arguably difficult to be established and identified. Due to varying quality standard from each quality inspector, the square feet quantity of each hide is impossible to confirm before the result of on-site quality inspection. As for Chemicals, the formulated quality inspection standard is established without argument and the shipment quantity mostly conforms to the order quantity. However, during transportation, there is very likelihood of freight breaches disruption defined by Sheffi et al. (2003) in their supply chain failure mode. In addition, the characteristic of long lead-time in the procurement of raw materials has made the existing sourcing policy skew toward multiple sourcing strategies. The existing general sourcing policy also resulted from the concerns of huge quantity demand and insufficient capacity of single supplier, not to mention the possibility of contingent situations. The findings show that the concerns conform to the benefits and drawbacks of single and multiple sourcing strategies which are argued by Mohr and Spekman (1994), Piaw (2002), and Ramsay and Wilson (1990). Therefore, single sourcing of purchases is not suitable for leather manufacturing

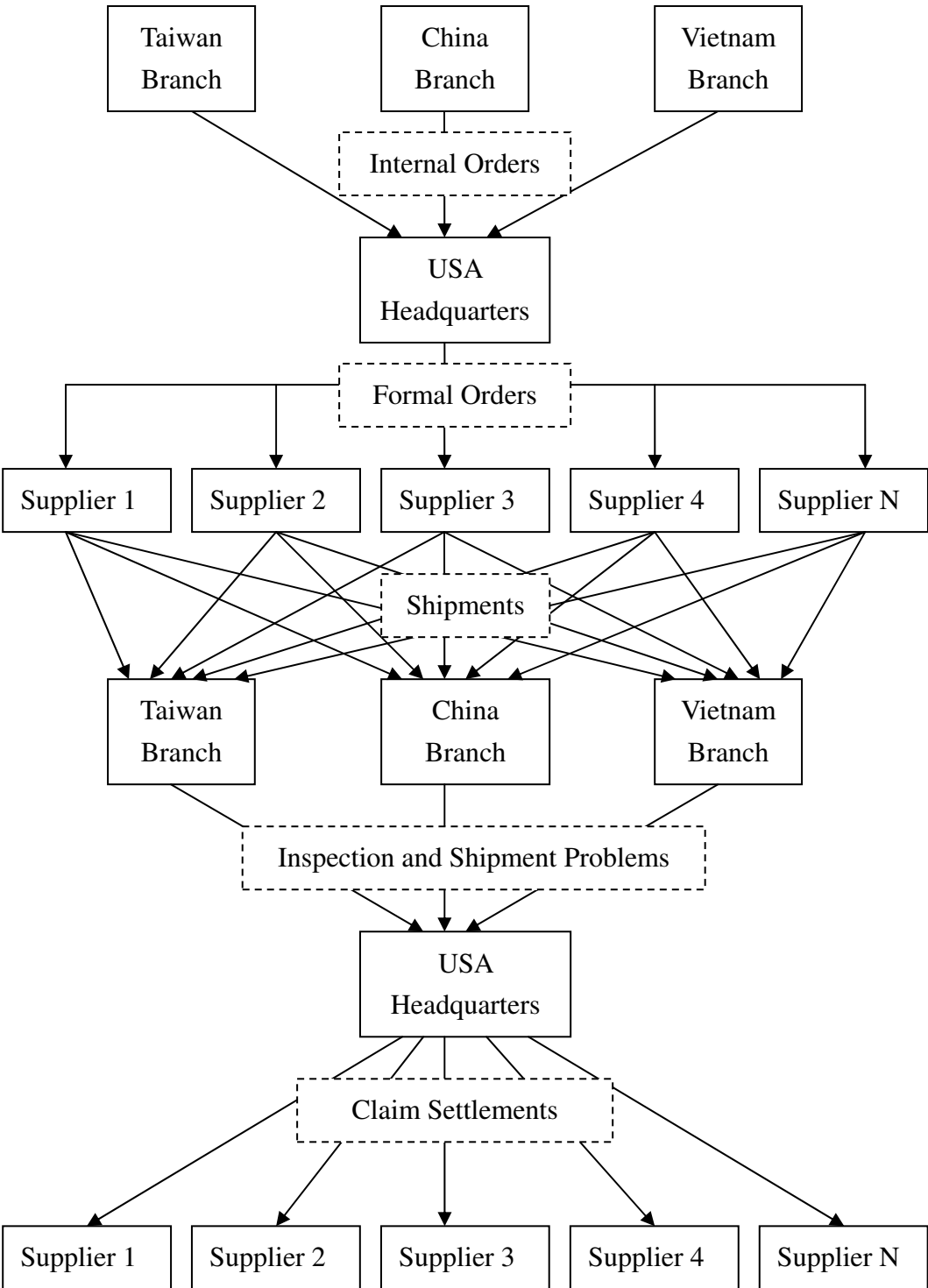
industry other than what is expected, given the findings of the literature survey that single sourcing is becoming the norm in the manufacturing industry.

The statements from the top management about the general sourcing policy arguably provided more questions about the factors affecting sourcing decisions, such as organisational structure, organisational culture, political issue and power. The additional finding concerning Prime Asia's general sourcing policy is its raw material purchasing management which is affected by the factors of organisational structure, power, and political issue, and would impose higher pressure of disruption risks in the supply chain management.

Since Prime Asia Group was incorporated as a joint venture between Pou Chen Group in Taiwan and Prime Tanning in U.S.A., the procurement of 'wet blue' was compromised to be controlled and managed by Prime Tanning in U.S.A which sifted qualified suppliers from its 'wet blue' supplier base and maintain beneficial relationship with all the 'wet blue' suppliers in U.S.A., Brazil, Argentina, and Australia. Figure 4.1 represents Prime Asia's centralised and inextricable purchasing procedure of 'wet blue'. The branches in Taiwan, China, Vietnam place internal orders to U.S.A. headquarters, and then formal orders are consolidated and placed to

multiple suppliers in various countries. 'Wet blue' suppliers produce and ship out the goods directly to the branches respectively. If any quality problems are encountered after time-consuming inspection procedure by intensive labours, branches need to report back the U.S.A. headquarters which will negotiate with suppliers and settle down the quality problem claims either by return and replacement of the materials, or by percentage allowance. If the claims are settled by replacement, the procedure shown in Figure 4.1 will be carried out repeatedly. Regardless of the disruption pressure derived from supplier side, the inextricable and burdensome procurement procedures prolong the initial three-month lead-time of 'wet blue' and would cause a hidden crisis from the inefficient purchasing management. However, according to literature reviewed, centralised purchasing management would obtain economies of scale from the consolidation of all the orders from each branch.

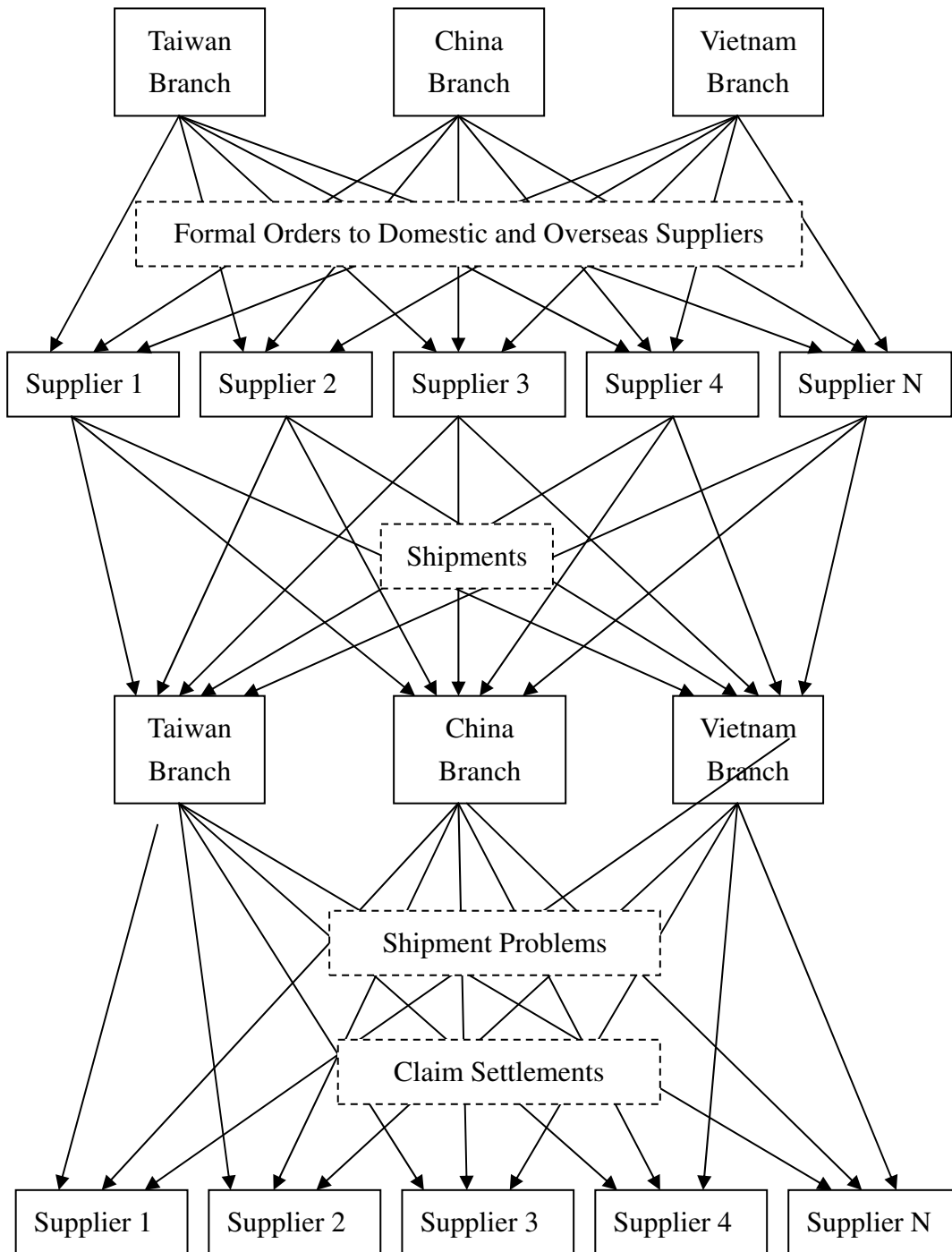
Figure 4.1: Centralised Purchasing Procedure of ‘Wet Blue’



Source: Prime Asia Interviews 2005

Opposite to the centralised purchasing management of 'wet blue', the purchasing management of chemicals is controlled by each branch. Figure 4.2 indicates Prime Asia's decentralised and inextricable purchasing procedure of chemicals, which is completely different from that of 'wet blue'. This finding is interesting and relevant to Prime Asia's initiatives of sourcing policy since obviously its sourcing policy of raw materials is mainly affected by the nature of various raw materials.

Figure 4.2: Decentralised Purchasing Procedure of Chemicals



Source: Prime Asia Interviews 2005

As shown in Figure 4.2, the branches in Taiwan, China, and Vietnam place formal orders directly to various domestic and overseas chemicals suppliers. After the

production, the shipments are arranged directly back to each branch. Any quality problems and shipment problems are handled between each branch and the suppliers. However, evaluating from the aspect of organisational structure for chemicals purchasing procedure, there is a waste of manpower resulted from three different procurement teams. Moreover, the organisation could not gain the benefits from the sharing of experiences, knowledge, information, and the relationship established with suppliers among these three branches. Most essential of all, Prime Asia would not gain the benefits from economies of scale by order consolidation.

Therefore, as suggested from literature review, the organisation needs to revisit existing sourcing strategies and purchasing management so as to evaluate the costs, benefits and risks, and to control and manage supply chain efficiently and effectively.

4.2 Variables into Sourcing Decisions: Using an Analytical Framework

Since Sako (1992), Carr and Truesdale (1992), Tikkanen (1998), and Harland et al. (1999) identified combinations of variables which would affect organisational sourcing policy as presented in chapter two literature review, this section would use Quayle's (2002) Analytical Framework for Sourcing to uncover the variables exist in Prime Asia, and how combinations of variables would influence its sourcing decisions,

which could be related back to research question five.

Having understood the general sourcing policy and purchasing management in Prime Asia, there is a need to identify the factors which are relative to how sourcing decisions are made. The data collected cover the variables identified as contingencies, criteria, and sourcing form. The outcome of the study clearly indicates the contingency and criteria variables that are statistically significant when Prime Asia makes sourcing decisions. Table 4.1 displays total contingencies and criteria variables found from the result of interviews according to Quayle's (2002) Analytical Framework for Sourcing.

Table 4.1 Variables for Sourcing Change in Prime Asia

Contingencies	Criteria
<ul style="list-style-type: none"> ● Individual <ul style="list-style-type: none"> - Individual competency - Past experience and knowledge - Individual perception & preference ● Products <ul style="list-style-type: none"> - Quality and service - pricing - Innovation pressure from customers - Development secrecy ● Organisation <ul style="list-style-type: none"> - Perceived importance of organisational policy to single and multiple sourcing 	<ul style="list-style-type: none"> ● Economic <ul style="list-style-type: none"> - Reducing purchasing costs - Price reduction - Supplier liquidation - Specialized item order - Buyer initiative to change sources of supply - Stimulating competition ● Power <ul style="list-style-type: none"> - Buyer power: size, pricing, payment term, economies of scale - Supplier power: size, capability, capacity, stability

<ul style="list-style-type: none"> - Annual review and feedback - Early supplier involvement - New strategies (JIT)/Objectives - Organisational structure - Organisational culture - Internal political power - Managerial implications <p>● Markets</p> <ul style="list-style-type: none"> - The state of market - Numbers of existing and potential suppliers - Shrinking/growing market - Market fashion trend - Market information: supplier reputation; WOM effect 	<p>● Risk</p> <ul style="list-style-type: none"> - Poor delivery by suppliers - long lead-time - Regulations - Political stability - Continuity of supply - Security of supply - Natural diseases - Terrorism Attack <p>● Social</p> <ul style="list-style-type: none"> - Government relationship - CSR issue - Culture difference - Relationship Management - Trust and honesty, and reputation
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Regarding contingencies in the framework, the years of experiences as sourcing decision making, the need for product innovation, the need for development secrecy, or the pricing are not significant in the findings. Surprisingly, organisational contingencies of an annual review, early supplier involvement, organisational structure, and political power appear to be not significant as well. The macro market contingencies of the state of market, whether there are too few or too many suppliers, whether the market is shrinking or growing and market fashion trend appear not to influence the sourcing decisions.

As for criterion in the framework, economic market competition criteria of existing

supplier price, supplier liquidation, specialized item order, and the stimulating competition have little significance from interview information. Shockingly, the criteria of risks from regulation, political stability, natural diseases, and terrorism attack have no significant impact, despite the fact that literature strongly argued that risk awareness has to take into account before investigating any crucial strategies. Though social criteria are identified by Prime Asia, this part only has little significance to Prime Asia.

Among the variables identified, the following five variables are the most significant from the result when Prime Asia makes sourcing decisions:

1. Organisational policy to single and multiple sourcing
2. Reducing purchasing costs
3. Poor delivery by suppliers for long lead-time raw materials
4. Continuity security of supply
5. Security of supply

These variables are an exciting discovery in the study of sourcing policy decisions.

Given that the purchasing dimensions of sales, market share, and market position are influenced by advertising, level of competition, product, pricing, and individual

competency, finding that these five variables are significant is truly remarkable. The results arguably confound what practitioners and academics may have been assuming about the sourcing decision processes. The implications of the significance of these five variables will be elaborated in the next section.

4.3 Significant Variables

In this section, the significant variables associated with sourcing decision making processes are examined.

4.3.1 Organisational Policy

This variable shows how influential organisational policy is perceived to be by the decision makers interviewed with. The more powerful the policy is, the more likely it will affect the sourcing decision making processes. If there is clearly an organisational policy to multiple source, the outcome of sourcing decisions is more likely to be multiple sourcing policy. If organisational policy is not influential, the change of sourcing policy to single or multiple strategies would have never occurred. In the case study, it is argued from the interview outcome that Prime Asia's organisational policy has remarkable influences on sourcing decision making, for five out of the eight top managers implied that the motive of

sourcing policy change, or the purchasing management is mainly from the indication of organisational policy. Furthermore, this phenomenon of decision making has become one part of the deep-rooted organisational culture in Prime Asia. Unless the organisation itself has the intention to shift its sourcing policy or purchasing management, the existing sourcing policy or purchasing management will not be modified or changed, no matter how inefficient current sourcing policies and purchasing management are. However, according to Biemans and Brand's (1995) arguments, strategic management of purchasing may reduce total purchasing expenditure by between 5 to 15 % over a three-year period. If the decision makers are managing supply chain or the whole business unit so passively, how efficient and effective the supply chain management of Prime Asia is would remain in doubt.

4.3.2 Reducing Purchasing Costs

The importance of reducing purchasing costs is to a large extent, manifest. Attention has turned in Prime Asia to reducing operational costs, including the purchasing costs. Purchasing costs would be reduced by negotiating terms and conditions with suppliers while attempting to improve its market positions. The suppliers would be more amenable to providing attractive terms because of Prime

Asia's being a big organisation and the need of huge quantity of raw materials. With the intention of reducing purchasing costs, Prime Asia is moving from multiple toward single sourcing by reducing current supplier base, but not only one supplier, since less suppliers may reduce purchasing cost, in terms of less administrative tasks, such as purchase orders, progress following-up, and communication expenditure. However, it could be argued that while administration costs might fall, other costs might be rising and probably more than compensation. As has been argued in literature review, the decision as to whether choose single or multiple source involves complex and difficult tradeoffs. Whatever strategies are preferred, it is an important motivational point for the organisations to consider prudently about the tradeoffs among the possible choices, trying to obtain the most suitable and beneficial strategies.

4.3.3 Poor Delivery by Suppliers

Another factor that would have great impact on the sourcing decisions making processes is poor delivery by suppliers, especially when the raw materials in Prime Asia require three-month long lead-time. The suppliers are arguable significant relationships for the organisations, particularly those that adopt single sourcing policy. Such relationships are predicated on the notion of implementing

mutually agreeable purchasing strategies. Organisations expect the well interactive relationships with suppliers would bring overwhelming success. However, poor delivery by suppliers is a threat to such relationships and it would jeopardize efficient and effective supply chain management. Furthermore, poor delivery would provide crucial evidence that the relationships with suppliers are not reliable and not working out eventually. A delivery date is a clear performance indicator, unlike product quality. It is obvious when a delivery is not on time and this makes very clear the fact that the supplier has failed. Although Prime Asia takes advantages of contract signed with suppliers to control and ensure on-time delivery, there may be the occasion of the supplier's failure despite its best effort. The delivery dates may have been optimistic, or the problems outside the control of the supplier may have occurred. Prime Asia's solution to this problem is obvious and possible to supplement the supplier by others, even though the supplier is both competent and keen. This is the main strategy of risk diversification adopted by Prime Asia, and this also has excellent credibility in any organisation facing the problem of poor delivery. Since Prime Asia cannot bear the loss of orders and market share resulted from poor delivery, multiple sourcing policy is preferred during sourcing policy decision making processes. Moreover, the long lead-time of raw materials and the huge quantity required

make 'poor delivery' an even more essential factor to consider with. Therefore, for Prime Asia or any organisations, they have to re-evaluate the performance of suppliers in this crucial situation where the visibility of poor delivery is perceived essential, and then to re-visit their current sourcing policy and purchasing management in the supply chain.

4.3.4 Continuity of Supply

Obviously, the arguments against poor delivery would not exist if continuity of supply is not essential to organisations. However, it is noted that most organisations would argue that continuity of supply is important. Furthermore, from literature review, continuity of supply is one of the main challenges in supply chain management. For Prime Asia, continuity of supply is extremely important due to the nature of the raw materials and the characteristics of long lead-time. If unfortunately any disruptions of supply occur, it would bring unprecedented disaster to the supply chain management. Therefore, it follows that in those organisations, such as Prime Asia, where continuity of supply is very important and poor delivery has occurred, the need for change is substantial. As argued previously, in this situation, the credible solution is to diversify the risk among more suppliers, or prudently filter unqualified suppliers out of the supplier base.

4.3.5 Security of Supply

The importance of security of supply is linked to the importance of continuity of supply. However, whereas continuity of supply is linked to maintaining a flow of supplies, security of supply can be aimed at ensuring that supplies remain available from the market. Regarding Prime Asia's adoption of multiple sourcing, it could be beneficial in situations where suppliers need to be kept producing one raw material where the source availability is not large, and without the raw material, Prime Asia's production facility may be seriously disrupted. This is by no means protection of the market. In addition, relating this to Prime Asia's current situation, suppliers of 'wet blue' and distinctive chemicals are few in the market mainly because of the process difficulties and environmental protection limitation. Moreover, suppliers are located in various countries, some of which are politically hostile locations. Therefore, Prime Asia adopts multiple sourcing strategies to secure continuous supply of distinctive and long lead-time raw materials. Over again, the same arguments apply to both security of supply and the continuity of supply. The difference is that the former is more concerned with long-term, strategic security while the latter with short term, tactical security.

4.4 General Discussions

It is possible to summarize the outcome of the study by comparing the variables that are more highly correlated with the existing sourcing decision making processes Prime Asia adopts. The most crucial factor is the perceived significance of organisational policy. Another vital internal factor is the need to reduce purchasing costs and a move to reduce supplier base, which could effectively achieve the aim of reducing purchasing costs while possibly resulting in increased costs elsewhere. However, it is interesting to find out that two external contingency variables, price demand and the state of the market, which are claimed to be essential factors in sourcing decision making processes from literature review, appear to be not significant in Prime Asia. Furthermore, Prime Asia's sourcing policy has largely to do with the risk in relation to delivery and supply. It follows the traditional way of coping with these problems by diversifying the risks through multiple suppliers in various locations. At risk of oversimplifying, it could be argued that the choice of multiple sourcing policy is mainly ideologically driven, with some impacts from more contingent variables. What is more, Prime Asia's current sourcing policy is largely driven by traditional responses to the purpose of reducing purchasing costs, and to the problems with poor delivery and supply disruptions. However, except for the attention to poor delivery which would harm the continuity and security of supply, Prime Asia

pays little attention to other potential igniters which could also result in disruptions in supply chain. Furthermore, Prime Asia never evaluates the trade-offs among uncertainty, risks, and costs in its supply chain management. In this way, it would be impossible for Prime Asia to control and manage its supply chain network efficiently and effectively. Therefore, in the following chapter, some implications from the study and recommendations for resilient supply chain and for future research are indicated.

CHAPTER 5—RECOMMENDATIONS AND COCLUSIONS

5.1 Implications

An overall implication of this study could be the buyer's dilemma when making the sourcing decision to protect supply chain against disruption risks. As suggested from literature review, single sourcing is a prevailing and better sourcing policy because this choice would make it easier and less costly to control and manage supply chain. Furthermore, it is more likely to be a more effective and efficient sourcing policy. However, if the risks of disruption or other contingencies are taken into consideration, single sourcing may not be a better policy. In other words, it would be drawn from the literature review, which led to the theoretical framework, that contingency is essential. It could not be argued, under all conditions and in all contexts, that single or multiple sourcing is superior. It would depend on the situation since the same objectives of improving performance or hedging disruption risks could be achieved by the use of either single or multiple sourcing. Moreover, since the environment is swiftly changing, one sourcing policy may be suitable at present, but may not be appropriate in the future.

5.1.1 Economists

The outcome of the study should be of interest to economists as well. For the

economist, purchasing is grounded in the transaction cost economics and of opportunistic behaviour. However, except lead-time and reduction in supplier base, the traditional economic factors of price, stimulation of competition, poor quality, and buyer initiatives do not appear as important in sourcing choice and decision as the literature has suggested. The traditional model which includes these factors is likely to perform less well than the one which incorporates key behavioural variables, organisation policy in particular.

5.1.2 Marketing

This study also indicates that buyers are clearly influenced by current organisational sourcing policy. This implies that marketers in business must consider the purchasing organisation's sourcing preferences in its decision. In addition to the buyers' perceptions and attitudes to suppliers, buyers' specific product delivery perceptions are a very important factor regardless of product ranges considered. This implies that organisations may not be able to always market a link between their products and quality images if suppliers cannot deliver on time. This study also indicates that the buyers' perception of reducing purchasing costs is very essential, particularly under consideration to change current sourcing policy. Therefore, marketers should consider researching what

the pricing image is and how to build up an encouraging image. As for the state of market, it appears to be less significant in the case since the scale of Prime Asia is large enough to gain buyer's power in the market. Therefore, this offers marketers a different angle from organisation's perception and culture of the state of market in leather manufacturing industry.

5.1.3 Purchasing

For the purchaser, purchasing is all about the right price, right time, right quality, right quantity, and buyer professionalism. The literature consistently informs that purchasing policy is focused on the concepts such as single sourcing, partnership, and JIT. However, this study has implied that single sourcing and JIT are not as widely implemented as literature would suggest. As organisations try to make fundamental changes to improve performance and to manage disruption risks in uncertain environment, correct sourcing policy and purchasing are facing challenges. To become more efficient and effective in supply chain, organisations are suggested to adapt to the changes and review the manner in which they formulate and carry out purchasing strategy as a major component of corporate performance. Furthermore, global competition has raised the challenges of supply chain management and the stakes for success, but it has also provided purchasing

with new opportunities, if organisations could manage the risks of disruptions through sourcing policy in uncertain environment successfully.

Sourcing is a complicated decision, it is situation-specific. However, it is likely that policies do not allow flexibility to meet specific circumstances and may not be effective and efficient. Therefore, the challenges here for organisations are to make the right choice of suppliers. The various input factors to the choice may vary in importance and complexity in changing environments. For example, when potential suppliers are perceived by one buyer to be few and the product is strategically important, the buyer may be faced with uncertainty and complex choices. Therefore, the implication of purchasing for organisation from this study is to take account of the contingencies and criteria prevailing at the time of purchase so as to make the right or better decision on sourcing policy. If organisations do not take uncertainty into account, what it would bring for organisations is unprecedented risks and disasters.

5.1.4 Managerial Implications

Since there is no fixed sourcing policy for the procurement of raw materials in leather manufacturing industry and the outcome never conforms entirely to what

is suggested from literature review, the implications are for researchers and managers in marketing and purchasing areas in manufacturing industry to uncover more variables which are related to sourcing decisions making processes, and what are the empirical reasons that disruption risks in unpredictable and rapidly changing environment are not considered in the process of sourcing decision making in leather manufacturing industry, as literature argued that it is essential.

Managers are aware that supply chain is vulnerable and are concerned about disruptions. However, most managers share the same disorientation on how to deal with them effectively in unpredictable environments. From the study, some recommendations could be deduced for managers to manage disruption risks within supply chain. It would be suggested that Prime Asia revisit its current sourcing strategies, evaluate a trade-off between lean manufacturing, JIT and risk management, build a risk awareness culture, and introduce flexibility to enhance resilience in the supply chain network. In addition to the recommendations for resilient supply chain building, the study offers possibilities for further research into sourcing choice and sourcing decisions within the network of supply chain in leather manufacturing industry.

5.2 Recommendations to Build a More Resilient Supply Chain

5.2.1 Revisit Current Sourcing Strategies

Single sourcing and multiple sourcing have many advantages respectively. Single sourcing is cost-effective and permits to achieve higher quality standards, build stronger and long-term quality relationship with suppliers, reduce lead times and reduce inventory. However, it introduces a crucial level of risk since it relies on only one supplier and the supplier could go out of business, be merged, or reduce market intelligence and flexibility. An extended shortage for key components could cause organisations to close some plants and lose business. Contrarily, multiple sourcing provides a back-up source to protect the buyer during times of shortages, strikes or other emergencies. Furthermore, it could meet buyer's volume requirements to maintain competition in the market. However, multiple sourcing increases fixed cost, levels of waste, buffer stock levels, and the general level of supplier uncertainty. Therefore, organisations should revisit the advantages and disadvantages of both single sourcing and multiple sourcing strategies, and decide on better sourcing strategies to lower down the risks of disruption in the supply chain. It is essential that organisations should keep full and continuous review of financial results and operational stability of its suppliers, which allows them to monitor the probability of disruption. The organisations

would only continue business with strong and stable suppliers, and favour those with more than one manufacturing site to secure supply chain. Moreover, the organisations would establish a local supply source or establish multiple supply sources with the appropriate manufacturing capabilities to protect disruption risks.

5.2.2 Evaluate Trade-offs between Lean Practices or JIT and Risks

As mentioned previously, the main reason that has made supply chain networks more vulnerable is the prevailing application Lean Manufacturing or JIT. Organisations utilise these approaches to eliminate all the wastes in the supply chain, and focus on cost reduction by centralising their assets, reducing supplier base or decreasing dramatically the buffer stocks. Moreover, Martha and Vratimos (2002) estimated that inventory costs in the auto industry have been reduced by more than \$1 billion a year thanks to JIT techniques. Therefore, it would be bizarre to completely abandon those practices. However, benefits and costs must be weighed and balanced against potential risks of disruptions. In other words, adjustments need to be made with the acknowledgement of trade-offs between lean manufacturing or JIT and risks.

5.2.3 Build a Risk Awareness Culture

Recent supply chain networks have become more vulnerable due to lean practices and JIT manufacturing, and increased external risks such as political instabilities and terrorism actions. It is recommended that decision makers must be aware of the vulnerabilities exist in the supply chains and all employees in the organisations share this risk awareness and understand individual role in the risk management process. Moreover, one effective way suggested to achieve this is to build a culture of risk within the organisations in the same way as quality has been embedded into the cultural fabric.

The consideration of risks should lead to organisational changes and influence the supply chain design, including sourcing policy. Although risk management is not the first priority of an organisation, the concern is so essential that it should be in the forefront of supply chain management and be utilised to constitute strategic advantages. Therefore, building a risk awareness culture in the organisations is argued to be one of the key factors for the formation of a more resilient supply chain.

5.2.4 Introduce Flexibility to Enhance Resilience

According to Christopher and Towill (2002), there is growing significance of adding value through flexibility in supply chain management. Flexibility is defined as the ability to respond to changes in the environment (Viswanadham and Raghavan, 1997). Flexibility is also treated as one of the key considerations between single and multiple sourcing strategies. Having a flexible supply chain will allow firms to adjust the supply chain according to the availability of resources, and quickly take remedial actions to minimize the impact of unexpected disruptions. In this aspect, organisations could build operating links to facilitate a rapid changeover when needed. For example, organisations could redesign their manufacturing processes to be more standard. It will permit the organisations to switch more easily from one plant to another or from one supplier to another. In addition, take Prime Asia as an example. It could devote appropriate resources to develop substitutes for critical chemicals and 'wet blue' materials so as to increase flexibility and meanwhile, increase the buyer's power in purchasing management.

5.3 Recommendations for Future Research

In addition to the recommendations for resilient supply chain building, the study offers possibilities for further research into sourcing choice and sourcing decisions

within the supply chain networks in leather manufacturing industry. This section provides with a few recommendations on possible further research.

5.3.1 Analyse the Linkage of Sourcing Policy and Disruption Risks

Although it is claimed from literatures that appropriate sourcing policy and sourcing decisions would mitigate potential disruption risks in supply chain networks, there is no empirical evidence to prove that the linkage between sourcing policy and disruption risks is strongly and closely linked. If this assumption is verified, it is of significant meanings for researchers and practitioners to devote more efforts and resources to sourcing policy and sourcing decisions in leather manufacturing industry so as to mitigate supply chain disruption risks.

5.3.2 Quantify the Trade-offs among Benefits, Costs, and Risks

Organisations are aware of the crucial part of trade-offs among benefits, costs, and risks. However, few researches focus on establishing a viable framework or model to quantify the trade-offs among benefits, costs, and risks. As mentioned previously, decision makers receive intensive messages that disruption risks would paralyse supply chain and risk management is essential in the networks.

Furthermore, the benefits brought by lean practices and JIT manufacturing are significant and cost-effective, but after the levels of stocks have been reduced dramatically, the risks of disruption have ascended at the same time. How should organisations standardize the criteria to find the optimal balance? Therefore, for future research, a model to test the assumptions on real data and to quantify the trade-offs among benefits, costs, and risks would be of great help for decision makers in organisations to judge and ensure that the benefits are worth the costs in decision making processes.

5.3.3 Analyse the Supplier Side

In this study, four variables out of the five significant variables into sourcing decisions are relative to supplier side, which implies that suppliers play an essential role in supply chain networks and they carry out the disruption uncertainty. However, the access to both buyers and suppliers is difficult to obtain, and most strategies in literatures are considered mostly from buyer's side. In normal situations, buyers would take advantages of contracts to protect themselves against risks and shift the costs and risks on to suppliers. Therefore, the contract with suppliers is in reality the insurance for the buyers. However, being able to carry out the contract to ensure continuous and secure supply for the

buyers, the suppliers have to maintain additional capacity and to bear the burden of extra costs and risks. Another option for suppliers is to shift production from other customers who have less demanding time constraints. Or, the suppliers could make contracts with other suppliers in emergency, or maintain lots of raw materials, etc...The solutions that are taken by suppliers depend on the specific situations, and these might be considered only if disruptions are rare.

In the same way the study does for the buyers, it is necessary to weigh the costs and benefits of the different approaches that are available for the suppliers. There are two essential questions: at which price and cost should the suppliers supply raw materials in normal situations, and which risks could be accepted by suppliers?

The heart of these questions is to find the balance of the contract that works for both parties. As discussed in literatures, the supply chain networks are complex and uncertain, so the analysis of supply side is worthy researching.

5.4 Conclusions

Appropriate sourcing decisions to specific situations in rapidly changing environment would benefit disruption risks management. After years of moving to demand-driven and lean manufacturing or Just-in-Time (JIT) practices among manufacturers, it has

resulted in increasingly vulnerable and fragile supply chains. Although prevailing lean manufacturing or JIT practices are cost effective as evidenced from literature review, supply chain strategies still depend on specific industry and situations. Since the environment is swiftly changing and unpredictable, organisations have to be willing to adapt to changing environment. However, before making any changes on organisational policy and strategies, organisations should be aware of the trade-offs, evaluate the trade-offs, and then find the balance among the trade-offs to organisational objectives. It is dangerous for organisations to follow fashionable strategies only because others are adopting them, for the benefits of any strategies gained from literature review do not fit into every industry or every organisation.

In this study, it is suggested that sourcing policy and sourcing decisions play a significant role in protecting supply chain against disruption risks after utilising the Analytical Framework for Sourcing—a Contingency and Criteria Model by Quayle (2002) to examine the case study in the aspect of essential variables in sourcing decisions. In addition, the variables identified and evaluated from sourcing decision making processes do help decision makers to find a better alternative of sourcing policy for the organisation to protect supply chain against disruption risks and to obtain and sustain competitive advantages through supply chain management.

Before controlling and managing disruption risks through sourcing decisions in supply chain, it is suggested that organisations should examine external and internal potential risks to build a risk awareness culture across the networks and to introduce flexibility for more resilient supply chain networks. Since disruption risks are unpredictable and inevitable, organisations should embrace them and tackle them properly. Proper preparation before occurrences would mitigate the harm brought by supply chain disruption to organisations. Since there are always trade-offs for any strategies, organisations should find the balance among the trade-offs and adapt to specific situations in rapidly changing environment so as to transit weakness into strength, even into sustained competitive advantages in supply chain management.

APPENDIX A:

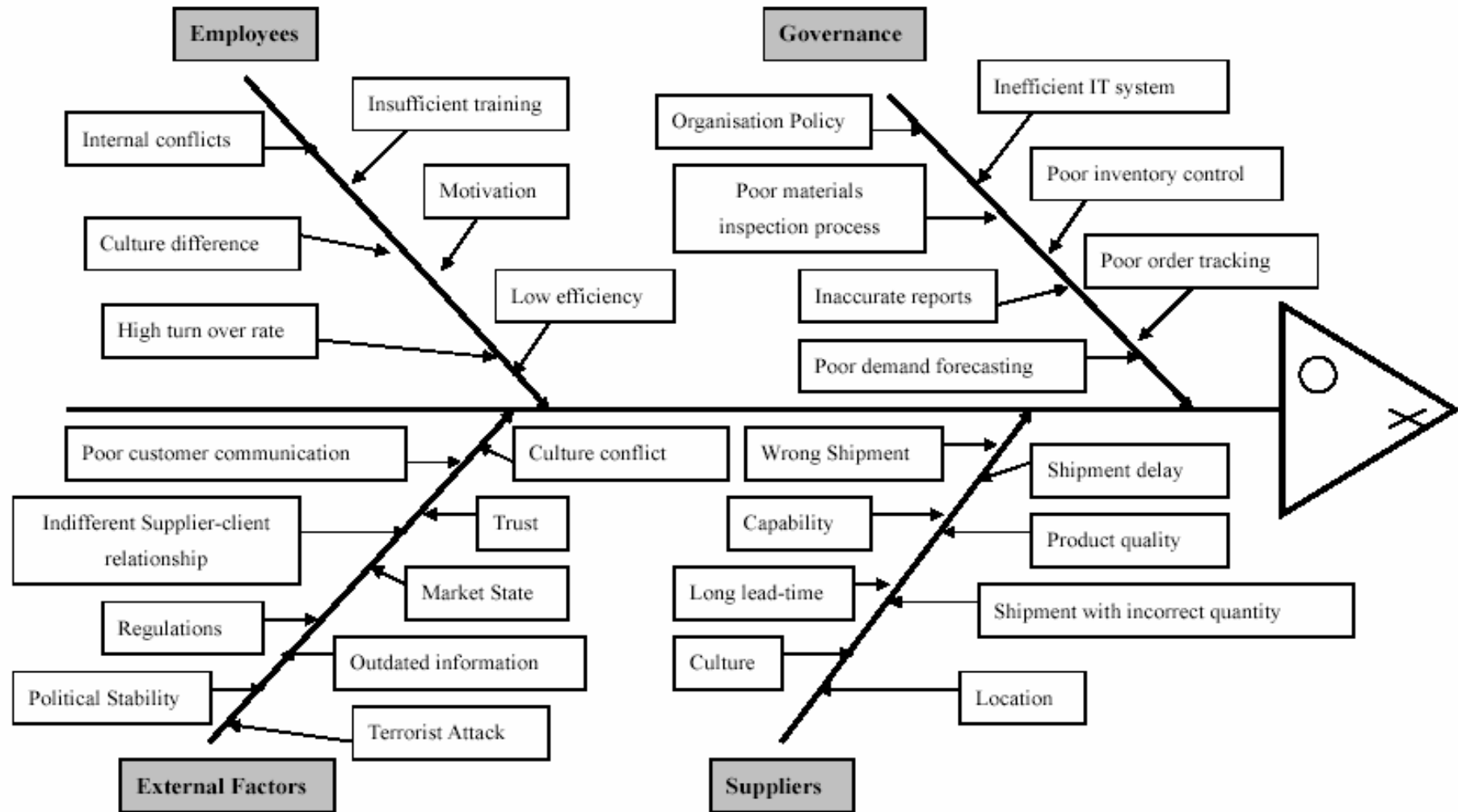
18 Best Practices for Supply Chain Risk Management

1. Screen and regularly monitor current and potential suppliers for possible supply chain risks.
2. Require critical suppliers to produce a detailed disruption-awareness plan and/or business-continuity plan.
3. Include the expected costs of disruption and operational problem resolution in the sourcing total-cost equation.
4. Require suppliers to be prepared to electronically share timely information and visibility of material flows with your organisation.
5. Conduct frequent teleconferences with critical suppliers to identify issues that may disrupt daily operations and tactics to minimize them.
6. Seek security enhancements that comply with C-TPAT, CSI, and similar initiatives.
7. Test and implement technologies to track containers to enhance global inventory visibility.
8. Conduct a detailed incident report and analysis following a major disruption.
9. Create exception-detection/early-warning systems.
10. Gather supply chain intelligence and monitor critical supply-base locations.
11. Improve visibility of inventory buffers in domestic distribution channels at the part level.
12. Classify buffered material by its level of criticality.
13. Train key employees and groups to improve real-time decision-making capabilities.
14. Develop decision-support tools that enable the company to reconfigure the supply chain in real time.
15. Develop predictive analysis systems that incorporate intelligent search agents and dynamic risk indices.
16. Construct damage-control plans for likely disruption scenarios.
17. Understand the cost trade-offs for different risk-mitigation strategies.
18. Enhance systemwide visibility and supply chain intelligence by using improved near-real-time databases.

Source: Elkins, D., Handfield, R. B., Blackhurst, J. and Craighead, C. W. (2005) "18 Ways to Guard against Disruption," *Supply Chain Management Review*, Vol. 9, Issue 1, page 49.

APPENDIX B:

FISH BONE ANALYSIS



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