

Chapter No. 1

Introduction

1.1 Introduction to Strategic Sourcing and Indian Automobile Industry

For decades "sourcing" has been just another word for procurement and considered as a peripheral corporate function (Sartor et al., 2014). Globalization and rapid innovation have brought sourcing in center stage (Attren and Attren, 2018). Strategic sourcing can be defined as 'satisfying business needs from markets via the proactive and planned analysis of supply markets and the selection/ pelleting of suppliers with the objective of delivering solutions to meet pre-determined and agreed business needs' (Lorentz et al., 2013). Strategic sourcing, a logical process involving an application of tools by skilled and knowledgeable people, includes a wide range of activities namely creating an overall strategy for sourcing, evaluating and selecting suppliers, procuring materials/ services and managing supplier relationships (Gottfredson et al., 2015). Strategic sourcing is increasingly seen to be a business capability of firms (Holweg et al., 2011; Park and Kim, 2016).

Sourcing decisions are vital for any organization that wants to leverage on its core competencies and outsource other activities in order to gain and retain competitiveness (Wei et al., 2018). The strategic importance of sourcing has increased over time (Quinn and Hilmer, 1994) and has been projected to increase in the future (Benton, 2007; Singh et al., 2018). Further, this strategic importance is prevalent in both the manufacturing and service industries (Monczka et al., 1991; Monczka and Morgan, 2000; Christopher and Lee, 2009). With the decline of the vertically integrated business model, sourcing is evolving into a strategic process for organizing and fine-tuning the value chain (Negi et al., 2018). Manufacturing companies have realized the need for elevating traditional procurement function to modern strategic sourcing for value addition (Kahkanen and Lintunkagnas, 2018). This is the area that has huge potential for cost reductions (Soni and Kodali, 2013).

Universally, the automotive industry has been accepted as a major driver of growth of a nation's economy contributing significantly to the global economy (3% of total world GDP output). The automobile has been described as "both a form and function" based product involving a high level of engineering as well as being positioned as a fashion product (Thomas, 2009). The industry has rightly been called as "the industry of industries" since it uses outputs

of nearly all manufacturing industries (Drucker, 1946) and supports upstream (mining, steel etc) and downstream industries (finance, insurance, after-market etc.) (AT Kearney, 2013). Infusion of technology has led to the incorporation of electronics (sensors, actuators), advanced design techniques in the design of assemblies - engine, brake system, steering etc, built-in test equipment, entertainment and navigation system and advancements in materials and design (Veloso, 2000; NSDC, 2012).

India, China and Brazil are major emerging markets with robust domestic markets and adequate local production (Humphrey, 2000; Gomes, 2013). The industry is asset, material and labour intensive which calls for involved operational planning and execution at all levels of management including the sourcing strategies. Government interventions have been a major driving force for the development of the automobile industry in Brazil, China, South Korea, and the United States at the "Incubation, Penetration and Sustainability" stages (AT Kearney, 2013). Although the Indian automotive industry has its genesis in the 1940s, it has seen considerable growth in the last two decades mainly due to economic liberalization including 100% foreign direct investment (FDI) in the sector (Automotive, 2006). Recent changes in global economy resulted in India becoming as one of the cheapest sourcing destinations in the automotive map edging out archrivals like China, Mexico and Eastern Europe (Tang and Musa, 2011). Global auto and component manufacturing companies have been motivated to establish manufacturing and R&D facilities in the country due to the availability of a large pool of skilled workers, low production costs, faster design, and development process and also due to India's emerging market status. In line with this, many multi-national industries (BMW, Ford, Nissan, Honda, Suzuki) have identified India as a potential market for strong product growth and have started investing heavily by setting up manufacturing facilities and distribution centers (Mathiyazhagan et al., 2013). These foreign companies outsource most functions regionally, retaining control on product development and strategic procurement (Auto SCM India, 2006; ACMA, 2015). Manufacturing firms have increasingly formed strategic alliances with their global suppliers, even when highly specific assets are involved (Murray, 2001).

The Indian automobile industry comprises various groups, viz. Vehicle Assemblers (VAs), Indian component suppliers, multi-national component suppliers, each with specific strengths and weakness (Ray, 2012) with 77% of the production value contributed by the organized sector and the rest by SME sector (Gomes, 2013). The Indian automotive industry-VAs and auto component manufacturers are based on four clusters - North Indian, West India, South India and East India (Jadhav et al., 2015). The Indian automobile industry comprises 44

OEMs, 46 auto suppliers and 76 logistics service providers (whose turnover is more than Rs 500 crores) (Sharma and Routroy, 2014). Indian automobile industry encompasses passenger vehicles, commercial vehicles, three wheeler, and two-wheeler segments and shall emerge as the third largest market in the world (Maurice Bonney, 2011). The amount of money these organizations spend with suppliers is staggering (Reichhart, 2008). The amount spent with the suppliers as a percentage of total revenue is a good indicator of the supply's financial impact, a ratio that has remained constant in most industries for many years (Morgan et al., 2000). In almost all manufacturing organizations including the automobile industry, the supply area represents by far the largest single category of spending, ranging from 50 to 85 percent of revenue (Hult, 2002). Wages by comparison, typically amount only to about 10 to 20 percent of the revenue (Murray, 2004; Chiang et al., 2012; Su et al., 2013). Companies excelling in strategic sourcing save almost 10 to 20 times as much as it costs to operate their sourcing operations (Kotabe et al., 2004).

1.2 Why Risk Management (RM) in Strategic Sourcing (SS)

As seen from the above, sourcing of products from across the globe is increasing with economic development (Cheng and Cheu, 2018). Global sourcing has opened many avenues of cost reduction for companies and companies are sourcing from low-cost countries (Yin et al., 2017). However, these decisions can also have unintended consequences, exposing organizations to considerable risk (Engardio, 2001; Soni and Kodali, 2013; Baker et al., 2016). The popularity of strategic sourcing among both practitioners and academicians has been triggered by an increase in the frequency and intensity of manmade and natural disasters (Vining and Goberman, 2017). The recent catastrophes, like an earthquake at the scale of 8.9 followed by tsunami and leakages of radiations from a nuclear power plant in Japan in March 2011 and floods in Chennai in December 2015, have forced big companies like Sony, Toyota, and automobile hub in South India to close down their production. But not only these severe macro events lead to costly supply disruptions but also changes in economic, business and ecological environment cause supply networks to be more vulnerable (Yin et al., 2017).

Companies face many risks from different dimensions in sourcing decisions and risk management has increasingly attracted the attention of academicians and practitioners (Christopher and Lee, 2001). Numerous disruptions can result in a variety of problems such as

long lead-times, stock-outs, inability to meet customer demand, and increases in costs (Chopra and Sodhi, 2004; Manuj and Mentzer, 2008). Ultimately, these problems have an adverse effect on the financial performance of the firm (Hendricks and Singhal, 2005). Labour costs, fuel costs, and currency exchange rates for low-cost countries all fluctuate significantly, causing profitable sourcing strategies to turn unprofitable much more quickly than they have in the past (Buckley, 2018). Leading companies today have integrated workflows across engineering and procurement organizations to incorporate total-landed-cost analysis into engineering and procurement decisions (Ting and Cho, 2008; Eltantawy and Giunipero, 2013; Matos et al., 2017).

The global marketplace has become very volatile with customers demanding lower prices, faster delivery, higher quality and increasing variety (Narasimhan and Das, 1999; Christopher, 2000; Power and Sohal, 2001; Lee, 2004; Bottani, 2010). There are various reasons for an increase in supply chain complexity, such as higher level of R&D and manufacturing outsourcing to low-cost countries, globalization of firms for the motive of increased revenue, and increased dependence on supply networks (Vokurka and Lummus, 2000; Cheng and Cheu, 2018). Increased uncertainty necessitates higher allocation of resources to anticipate for demand, supply as well as intelligence uncertainties.

1.3 Important Constructs of Strategic Sourcing Risk Management (SSRM)

Initially, companies used to make some critical items within factory but over the last decade, there is increased reliance on supply markets. There seems to be a wide agreement on the factors that trigger sourcing decisions, with the primary factor being a reduction in the purchase price of goods. Managerial concern has increased towards value and procurement aggressiveness in developing suppliers to meet specific supply objectives of quality, quantity, delivery, price, service, and continuous improvement (Nassimbeni, 2006; Negi et al., 2018). The use of the concepts of purchasing, procurement, supply, supply network management and strategic sourcing risk management (SSRM) will vary from organization to organization. It will depend on their stage of development and/ or sophistication, the industry in which they operate, and their competitive position (Kim and Chai, 2017).

SSRM is becoming a focus area/ concern for supply network managers across the world including India. Present research attempts to develop a normative framework for SSRM by an empirical investigation of risk sources, risk drivers and SSRM practices in the Indian automobile industry. The Indian automobile industry was chosen because of its complexity and

its increasing inter-connectedness with the global automobile industry. In the following section, all four SSRM constructs are defined.

1.3.1 Definition of Risk

Bernstien (1996) defines risk as an occurrence of more things that can happen than envisaged. In classical decision theory, the risk is the possible downside and upside of a single rational and quantifiable decision, usually illustrated with the example of gambling (Kutsch and Hall, 2010). March and Shapira (1987) define risk as "variations in the distribution of the possible outcomes, their likelihood, and their subjective values". Managers only care about the probable losses of different risky events and do not consider about the range of possible outcomes. Royal society on risk analysis (1992) defines risk as "the probability that a particular adverse event occurs during a stated period of time".

1.3.2 Strategic Sourcing Risk

In strategic sourcing literature, vulnerability is defined as a condition that affects the firm's goal accomplishment and is dependent upon the occurrence of negative consequences of a disturbance (Jahangiri et al., 2017). The degree of vulnerability for a given disruption is proportional to a chance of occurrence and intensity of negative consequences (Svensson, 2000). A vulnerability is taken to be related to risk, in the sense that something is at risk; vulnerable; likely to be lost and damaged (Peck et al., 2003, 2005). Zsidisin (2003) and Wagner (2011) suggest that sourcing or supply risk is a multi-dimensional construct, interpreted by practitioners and academicians in numerous different ways. They define risk as the product of the probability of a given event and its severity (negative business impact). These constructs help to probe the concepts and provide a base where managers can understand the dynamics of supply/ sourcing risks (Chen et al., 2013). In a production establishment, it is often considered as part of supply chain management (SCM)/ supply network management (SNM).

1.3.3 Strategic Sourcing Risk Sources and Consequences

Strategic sourcing literature consists of different classifications for supply disruptions. Risk actually refers to sources of risk and uncertainty, such as political risk and market risk. On the other hand, the term risk is also used as an occurrence of risk, i.e. potential outcome indicators (Kim and Chai, 2017). The sources of strategic sourcing risks refer to the area or origins where risks are generated. Any event which affects the flow of material, finance or

information in the supply network is called risk and risk sources may be internal or external in nature. Supply network risk sources are environmental, organizational or supply network related variables that cannot be predicted with certainty and that have an impact on supply network outcomes (Fan et al., 2017). At the simplest level, four sources of risks are supply risk sources, process risk sources, control risk sources, and environmental risk sources (Juttner, 2003; Peck, 2005; Wagner and Bode 2008; Fawcett and Waller, 2011).

Risk management seeks to address all three dimensions of the risk construct, i.e. the likelihood of occurrence of a particular event or outcome, the consequences of the particular event or outcome occurring and the causal pathway leading to the event, by analyzing the sources, seeking to understand the forces, that may drive a particular sequence of events and how these might be managed to improve the chances of positive outcomes in terms of performance and, by corollary, avoid negative consequences.

1.3.4 Strategic Sourcing Risk Drivers

Among industry, risk-taking is perceived as an integrated and inevitable part of management (March and Shapira, 1987). Risk taking is a strategic choice and it has certain implications. Strategic sourcing risk drivers are the factors, which are competitive necessities for firms to gain competitive advantage. Recent trends like globalization, outsourcing, centralized distribution, and production have exacerbated the risk exposure (Christopher and Lee, 2001; Engardio, 2001; Craighead et al. 2007). Svensson (2000) used the term calculated risk that firms take in order to be competitive. On the other hand risk mitigation strategies are the strategic moves for companies that decrease risk in the various sources. Strategic sourcing risk drivers increase the risk implications (frequency of risk occurrence and negative impact) and risk mitigation strategies reduce the risk implications (frequency of risk occurrence and negative impact). Any effort that decreases the risk consequences is called mitigation strategy. From a single organization perspective, Miller (1992) presented five generic strategies that companies undertake to mitigate the negative effect of risky events. These generic risk mitigation strategies are reduce, avoid, transfer, share and accept. Suitability of the above strategies needs to be investigated.

Rao and Goldsby (2009) argue that business and organisational risks emerge from one or more of the five sources, namely environmental factors, industry factors, organisational factors, problem-specific factors, and decision-maker related factors. Relevant risk sources are environment characteristics, automobile industry characteristics, sourcing methodology,

organizational strategy, and decision-making variables. The risk drivers need to be related to the sources and there is potentially an infinite number of factors exposing the business to undesirable consequences in terms of performance and risk. Risk drivers identified by various researchers include globalisation, product variants, outsourcing, global sourcing, reduction of the supplier base/ and supplier concentration, focus on efficiency, partnerships and other close relationships, centralised distribution and production/ supplier and customer dependence.

Once the risks are assessed, a number of strategies can be used to manage risks. These include transferring risk, taking on the risk, eliminating risk, reducing risk and subdividing risk (Hallikas et al., 2004). Most researchers are unanimous in their belief that input and output market uncertainties are important risks and two ways of reducing the risks are reducing the frequency of occurrence of risky events (proactive strategies) and reducing the negative consequences of risky events after their occurrence (reactive strategies) (Khan and Burnes, 2008). Proactive strategies are decisions and activities that are aimed at reducing the probability of disruptions. Proactive strategies are implemented prior to the occurrence of risky events. The proactive strategies discussed in the literature are avoidance, investment in developmental activities, control strategy and integration (Sharma, 2016). Reactive strategies create a capability to mitigate the effects of disruption after the occurrence of said disruption and are built on the principle of recovery to include flexibility, redundant resources and risk pooling/ demand management strategies (Sharma and Routroy, 2014). An analysis of the impact of various mitigation strategies on various risks clearly shows that each risk mitigation strategy has limitations and there is a need to identify specific strategies for specific risks (Chopra and Sodhi, 2004).

1.4 Research Problem

The identified knowledge gaps through literature review related to the limited use of quantitative or mixed-method research approaches in strategic sourcing and risk management. Although many theories are highlighted as relevant, the research is limited to the application of theory in a business environment. The automobile industry has been a motivating arena for research in risk management (Grötsch et al., 2013). However, few empirical findings reveal that strategic sourcing risk management practices within this industry are still in their infancy (Blos et al., 2009; Thun and Hoenig, 2011). Although there has been much academic progress in risk management, empirical research within this field is still in its early stages (Blome and

Schoenherr, 2011). Some of the papers (Bevilacqua, et al., 2006; Gereffi, 2012) highlighted risk factors in sourcing decisions and have provided mitigation plans for risks involved in sourcing. There is still a need for empirical research that analyses the main risks and their sources (Thun and Hoenig, 2011; Lavastre, Gunasekaran, and Spalanzani, 2012). Researchers have worked on supply chain risk management (SCRM) and developed models for SCRM and stand alone supply chain management (SCM) areas. Specifically no research has been carried out in sourcing perspective in the automobile industry. The limited study on risk management in the Indian automotive industry with respect to the strategic sourcing appears to be because of it being extensively data-driven (Kotabe and Murray, 2004). Due to the lack of availability of data, in spite of awareness, though limited, there is very little focus given on strategic sourcing risk management in the automotive industry today. The identification of risk sources can be viewed as the trigger for risk management (Kern et al., 2012), and attempts to develop a risk profile for this industry that could serve as a risk assessment guide for practitioners of strategic sourcing to start the requisite strategic sourcing risk management processes in absence of extensive data in developing economies.

As suggested by Chopra and Sodhi (2004), the electronic industry is prone to risk due to short product lifecycle and high demand uncertainty. Ericsson risk management model (Norrman and Jansson, 2004) which was developed after a fire at its sub-supplier is one of the most discussed cases in the risk management literature. The aerospace, on the other hand, is exposed to risk due to its complexity. The product complexity, as well as the structure complexity, brings much risks and uncertainty to the aerospace sector (Sinha et al., 2004; Caniato et al., 2013). To a lesser extent, risk management has also addressed the automotive, telecommunication, semiconductors, machinery and machine tools, metal industry, and other sectors. Thus, a decision framework needs to be developed for bridging the gap between strategic sourcing decisions and risk factors in the automobile industry wherein the risk drivers, i.e. the enablers and barriers, are identified and their inter-se impact in the Indian automobile industry would provide the requisite inputs for the normative SSRM framework.

There are very few models that capture all types of costs in sourcing decisions, though no model has captured both cost and risk components. Other than evolved procurement maturity models, Holweg et al. (2011) provided an analytical model for global sourcing decision that captures only static and dynamic factors. Companies struggle to find a true cost of sourcing decision (Black, 2017). The risk factors have not been incorporated into costing

models. Selection of appropriate vendor for sourcing products and services is a prerequisite of strategic sourcing process and contributes significantly towards the competitive advantage and risk management of the company, especially in the manufacturing domain. Therefore, a felt need exists to formulate and study a vendor selection model for strategic sourcing requirements duly incorporating both costs and risks in the Indian automotive context. This model shall provide the requisite decision-making tool to plug in this research gap.

Hence, the key aim of this research is to come up with areas which still remain unresolved and come up with measures which improve the success factors for risk assessment and management in strategic sourcing of automobile industry (Lorentz et al., 2013) and bridge the gap between risk management frameworks and evolved procurement models. The existing knowledge gaps brought out by literature review provide the fundamental basis, guidance, and rationality for this research project.

1.5 Objectives of the Research

The research focuses on the following research objectives:

- To investigate the risk sources of strategic sourcing in the Indian automobile industry.
- To identify the risk drivers and study the risk management practices in strategic sourcing in the Indian automobile industry.
- To develop a vendor selection model incorporating risks and costs.
- To develop a risk management framework for strategic sourcing decisions.

1.6 Scope of the Research

The above-mentioned research objectives shall be studied as part of this research restricted to one industry, i.e. the automobile industry in the Indian context. In view of the global linkages and the industry spanning across the entire country, the study shall endeavor to encompass the complex facets of the strategic sourcing and risk management constructs and practices with an aim of developing an SSRM normative framework.

1.7 Outline of the Thesis

This section will describe the purpose of each chapter in this thesis.

Chapter 1: Introduction

This chapter introduces the topic of research and describes various parts of the research topic. The introductory chapter explains the relevance of the research problem in the context of developing a framework, research objectives, and methodology. This chapter also explains the outline of the thesis.

Chapter 2: Literature Review

An extensive review of the literature in the field of strategic sourcing, supply chain and risk management in the three broad categories namely, risk management, strategic sourcing, and supply network risk management is undertaken in this chapter. The research gaps are also identified for proposing a research framework. The proposed framework is drawn based on an understanding of extant literature and later identified research gaps.

Chapter 3: Research Design and Methodology

In this chapter research approach and research design is explained which have been employed to carry out the research. This chapter explains the overview of the research process adopted during the study and various issues like survey instrument development, modification in the survey questionnaire, sampling frame, and data collection procedure and research techniques: Exploratory Factor Analysis, Bayesian Belief Network, Analytical Hierarchy Process, and Data Envelopment Analysis. The details with respect to research design, methodology, data analysis, and discussion are discussed at appropriate places in the next three chapters, as different techniques are employed during the phases of research.

Chapter 4: Risk Sources and Risk Awareness in Strategic Sourcing: Development of an Indian Automobile Industry Risk Index

This chapter portrays the conceptual research framework on risk assessment by constructing a Bayesian belief network (BBN) model, which encompasses all the risk factors relevant to the Indian automobile sector that can give a fair empirical idea as to how much the risk factors drive down the gross turnover of the industry. Bayesian networks provide a very

useful risk assessment tool that takes into account the advantages of both quantitative and qualitative risk assessment methods. The model is used to gauge business, economic and external risks and evaluate its impact on gross turnover of the industry. The empirical model draws a lot of implications to streamline the risk effects in the industry, but it clearly shows that the three factors – business risks, economic risks, and external risks are not entirely independent and are positively correlated with each other.

Chapter 5: Strategic Sourcing Risk Management practices in Indian Automobile Industry: Force Field Analysis of Risk Drivers (Enablers and Barriers).

In this chapter, the developed framework and strategic imperatives of the framework are analyzed in the context of prevalent practices of strategic sourcing and identifying the risk drivers, i.e. various enablers and barriers of strategic sourcing risk management (SSRM). The research framework puts the risks in the prioritized order and also discusses supply network design factors which have risk implications (including drivers and strategies). This chapter explains the research process adopted and various issues, like survey instrument development, modification in the survey questionnaire, sampling frame and data collection procedure and research techniques. Responses were collected through a structured questionnaire from respondents belonging to senior management cadre including purchase/ procurement professionals in the industry. Factor analysis and force field analysis tools have been used for analysis. Through independent exploratory factor analysis (EFA), four SSRM enablers, namely, supplier risk assessment, data sharing in supply network, the partnership with a supplier, and supply flexibility were identified. Similarly, EFA revealed four SSRM barriers, namely, cost focus, ad-hoc or poor planning, data security/ privy breaches, and hard visualization of SSRM benefits.

Chapter 6: Vendor Selection Model Incorporating Risks and Costs into Global Sourcing Decisions

A risk management framework has been developed in form of a total cost of ownership model that incorporates the minor cost factors that are often ignored while making major/ strategic sourcing decisions factoring in the identified associated risks. Several subjective factors were also quantified in order to calculate the costs. The data envelopment analysis (DEA) approach has been used to calculate the weighted sums of inputs and outputs and hence the efficiency rate. All the developed constructs of SSRM have been put together to form a

normative decision-making framework, wherein based on the efficiency rate, the beneficial supplier is chosen. It has been established that a well-developed approach and strategy for offshoring greatly affects the total cost of outsourcing.

Chapter 7: Development and Validation of Strategic Sourcing Risk Management Normative Model

For all the developed constructs, managerial implications are summarized in this chapter. Finally, all the major constructs of strategic sourcing and risk management have been put together to synthesize an SSRM normative framework. In this chapter, the developed risk assessment framework and strategic imperatives of the framework are analyzed in the context of global sourcing decisions. The developed model is validated, wherein feedbacks were taken from SS/ procurement experts on the developed SSRM normative framework and validity was established.

Chapter 8: Conclusion and Future Scope of Research

This chapter includes a discussion on contributions of the research. The limitations are also provided by identifying its theoretical and implementation limits. This chapter also discusses the future scope of research.