Chapter No. 8

Conclusion and Future Scope of Research

8.1 Overview

The main purpose of this research was to study how automotive companies manage risks in their sourcing strategies/ supply networks. As a sequel to the preceding chapter wherein the development and validation of the strategic sourcing risk management (SSRM) normative framework (construction of a generalized Bayesian network model for Risk Assessment Index, exploratory factor analysis based SSRM enablers and drivers and cost and risk-based data envelopment analysis model for supplier selection) has been elaborated in this concluding chapter. It enumerates the summary of findings of the research in form of the theoretical and managerial implications for industry, limitations and the future scope of research.

This chapter is divided into five sections. In section 8.1, an overview of the chapter has been covered. The second section (8.2) presents the review of research objectives and findings. The third section (8.3) covers the contribution and findings of the study in form of the theoretical and managerial implications for industry. The fourth and fifth sections (8.4 and 8.5), encompasses limitations and the future scope of research respectively, followed by the conclusion in the last section (8.6).

8.2 Review of Research Objectives and Findings

The four research objectives, as enumerated in Chapter 1, are presented here first and answers and findings of these questions are presented thereafter.

- To investigate the risk sources of strategic sourcing in Indian automobile industry.

- To identify the risk drivers and study the risk management practices in strategic sourcing in Indian automobile industry.

- To develop a vendor selection model incorporating risks and costs.

- To develop a risk management framework for strategic sourcing decisions.

The first research objective has been achieved post extensive literature survey, followed by formulating the research design and detailed interaction with the industry professionals and

structured research details of which have been covered in Chapters 2, 3 and 4. A Bayesian network based model, incorporating both the qualitative as well as quantitative inputs, has been developed for the 'Risk Index for Indian Automobile Industry' by identifying the risk sources (business risk, economic risk and external risk) and obtaining data from both primary as well as secondary sources. From the findings and the sensitivity analysis as part of the study, it has emerged that there are many complex factors in play in the Indian automobile industry. The industry has put in place countermeasures and it appears to be well cushioned for high-risk environment.

The second research objective has been covered in detail in Chapters 2, 3 and 5. An EFA of the risk drivers of the strategic sourcing, followed by the force field analysis (FFA) of the enablers (Supplier risk assessment, Data sharing, Partnership with supplier & Supply flexibility) and barriers (Cost focus, Poor planning, Data security & Hard visualization of SSRM benefits) of SSRM in the Indian automobile industry has been undertaken.

The third research objective has been covered in detail in Chapter 6, wherein an analytical hierarchical process (AHP) and date envelopment analysis (DEA) based supplier selection model has been developed factoring in both the cost components and risk factors. The model has been tested by application to an Indian automobile OEM. The fourth objective, i.e. SSRM normative framework, has been delved upon in Chapters 6 and 7 of the thesis. The findings and relevant extracts of discussion have been covered hereafter in the next section.

In the fourth chapter on 'Risk sources and Risk awareness in Strategic Sourcing: Indian Automobile Industry Risk Index' various risk sources were studied in detail as to assess their damage potential and an Indian automobile risk assessment index has been developed incorporating data from both primary and secondary sources. The Indian automobile industry, which was the focus of this study, was found to be well placed for a high-risk environment.

Subsequently, the fifth chapter on 'Risk Drivers (Enablers & Barriers) with respect to the Strategic Sourcing in the Indian Automobile Industry' studied and analyzed the inter-relationship of factors and a force field analysis of both the positive and restraining forces was undertaken as part of this study. The salient findings point to barriers being more pronounced vis-à-vis the enablers. Inadequacy of data sharing, non-alignment of supply networks and poor planning merit attention and have to be addressed by having a well designed sourcing strategy.

The sixth chapter on 'Risk Management Framework: Supplier Selection Model incorporating Risks and Costs into Global Sourcing Decisions' studied the strategic sourcing models. An AHP and DEA based framework to arrive at the identification of the most suitable

choice of the supplier has been developed, followed by application of the same in a case study of one of the Indian automobile OEM. The comprehensive SSRM normative framework has been covered in the previous chapter.

8.3   Theoretical and Managerial Implications for Industry

Strategic sourcing management plays a centric role in overall automotive industry competitiveness (Naude and Badenhorst-Weiss 2012; Singh et al., 2017) and therefore, understanding and analysing involves studying it from the risk management context (Christopher and Jutner 2000; Lixandru, 2016). Based on this tenet, the study has examined the issue of SSRM ascertaining response from both VAs and their suppliers thus incorporating varying perspectives of all stakeholders. Also, this study has covered the entire issues taken from literature on risk management in automotive sector commencing with the strategic imperatives or motivation in adopting SSRM practices to the final outcome, i.e. competitive advantage. Therefore, this holistic aspect of SS coupled with the RM perspective makes this a unique and compelling study specifically in the context of the Indian automobile industry. The importance of obviating sourcing/ supply disruptions possibly due to external factors like tier 2 stoppages, disasters, supplier financial stress, suppliers' union issues etc., as part of the overall business strategy (Ellram, 1995; Carter and Rogers, 2008; Bhattacharya et al., 2016). The occurrence of any of the above events in the major countries from which a firm purchases materials for manufacturing its products or in which its finished goods are sold, may result in disruptions and delays in the operating activities of the company (Craighead et al., 2007; Seck et al., 2015). There have been quite a few studies in various aspects of sourcing/ supply network management in the automotive industry. However, these have mainly been concentrated in developed economies and focussed on specific aspects such as import of cost, outsourcing, global sourcing and determinants of SCM. This research has a number of implications for both academicians and practitioners. This study is, firstly, one of the few that explores the issue of SSRM in developing countries. The Indian auto sector has a strong positive correlation with macroeconomic factors and therefore, managers rely on country risk analysis and exchange rate risk while decision-making. Secondly, more significantly, it studies SSRM in a holistic manner as a 'continuum', from the strategic imperatives to the overall benefits accruing as a result of vehicle manufacturers/ assemblers (VAs) and their major suppliers adopting SSRM.

A new comprehensive theoretical SSRM normative model has been developed and tested which incorporates the theoretical and practical constructs of SS and RM and specific aspects which are focus areas adopted in the Indian automobile industry to ensure competitive advantage to the partners. This study would provide an insight into SSRM in a complex industry based on

theoretical foundations and offer researchers newer avenues for further analysis. The specific contribution of this research is to provide a methodology and model for sourcing/ supply risk assessment. The proposed BN modelling captures both subjective and objective data, which is very useful in the data paucity situations in emerging countries like India. Propriety firms or secondary sources data can compensate for lack of databases and experts inputs can be employed for probabilities of the subjective factors like supply disruptions. One of the important academic contribution of this research is to develop a sourcing/ supply risk model wherein for objective factors, secondary data has been collected. The effects of the three main risk sub-factors, i.e. business, economic and external, are not entirely projected in the final posterior probabilities of the Bayesian network model. This may be due to correlation amongst some of the sub-factors, with one sub-factor cancelling out the effects of another on the main factor.

This study provides an understanding as to how-transaction cost theory is applicable in a contemporary SSRM context and how interplay of cost factors (including minor) and risks (business, economic and external) impacts the strategic decision of supplier selection leading to competitive advantage for the firms by employing the DEA and AHP based model.

The quantitative analysis and the qualitative inputs in understanding the causal relationships using principal component analysis using varimax rotation method provide an understanding of the dynamics of enablers and barriers of the SSRM in the Indian automotive industry. The EFA results highlight that the SSRM barriers warrant greater attention for OEMs/ VAs to effectively incorporate sourcing strategies as part of the procurement process than the SSRM enablers. This study also brings out certain misgivings and areas of concern of the auto component manufacturers in entering into a long-term partnership with the VAs. Also, the RM perspective provides a better understanding of major benefits that are expected from adoption of SSRM practices.

Significantly, the study reveals that the automotive industry in India is well cushioned for high-risk environment. The posterior probabilities in the BN model depict that probability of high risk of the gross turnover of industry is 16%, much lower compared to the amount of risk factors in play. The probability of low-risk effect is slightly higher at 21%. The industry has taken quite a few steps to rectify the amount of effect the risk indicators can have on its net turnover. Overall, the study makes a significant contribution in an important aspect of SSRM in the complex automotive industry in a developing economy, which has its own set of peculiarities.

A new SSRM normative framework has been suggested based on strong theoretical considerations and practical insights of the complex automobile industry. The developed normative

framework has been largely validated through case study as well as qualitative inputs from the sourcing and higher management professionals. This model can be adapted by respective OEMs to meet their individual requirements. The framework could be utilised to structure management thinking for SSRM and can assist the managers in transition from strategic planning stage to operational execution stage.

At the theoretical level, the study contributes to the ongoing research in the field of SSRM. This empirical study examines how theory needs to be practically applied to the businesses for better results and substantiates relevant theories and quantitative models of SS and RM, such as transaction cost theory, Baye's network, force field analysis, DEA, AHP etc., and its applicability in the present day 'networked' environment. The aspect of RM as an important basis for implementing effective strategies for sourcing has been studied to some extent in the complex automotive industry. However, this study is unique as it examines the issue of SSRM in a holistic manner delving into the indicators and antecedents from the strategic imperatives to the resulting benefits.

This research sheds new light in the present status of SSRM in India's automotive industry and is especially relevant since it takes into consideration the perspectives of both VAs and their major suppliers and grass-root level issues in the procurement function. This study would afford an apt platform for further research in the complex issue especially since it is one of the few studies in this sector in the context of emerging economies. At the level of practitioners, this study clearly presents areas that need focus and more attention for implementing global SSRM process in the Indian context. It also highlights that the risk factors and minor cost components need to be better understood and appreciated especially in the local cultural context. Interestingly, the research brings out the fact that it is simple issues which encourage adopting of SSRM practices in Indian automotive industry as significant potential exists in this domain of strategic sourcing. The findings also indicate that there is support for the fact that adopting SSRM, would mutually benefit both OEMs/ VAs and the auto component manufacturers in the Indian automotive industry.

The specific contribution of the study extends to the following: .

• Identification of the strategic sourcing risk sources and development of a Bayesian network based 'Risk Assessment Index' model for Indian automobile industry employing both data from primary and secondary sources to address the peculiarities of developing economies.

- Identification of the SSRM risk drivers by detailed interaction with industry professionals and establish their inter-relations through EFA and conducting force field analysis of the identified barriers and enablers to help formulate appropriate strategies for sourcing requirements.

- Development of an AHP and DEA based effective and practical model for selection of the most suitable supplier in global sourcing context uniquely comprising both cost components and risk factors.

- Development of a comprehensive and holistic SSRM framework for the Indian automobile industry which can be effectively employed by the professionals.

- Providing a platform to the Indian automobile industry by harnessing the advantages of SSRM.

8.4 Limitations

A significant limitation in conducting this study arose from the fact that very few managers at the operational level really understood the larger impact, dimensions and advantages that accrue from risk management perspective of the strategic sourcing. This may be due to the Indian automotive industry being in the growth phase wherein global supply network (procurement related) practices are yet to be fully absorbed. Therefore, many of the respondents may not have fully grasped the impact of SSRM on various issues raised in the survey instrument. This may have adversely affected some of the deductions made and in developing the structural model. Sample selection bias may have existed as the respondents in the survey were mainly from three major clusters in the Indian automotive industry and there may be some uncontrolled factors impinging on the conclusions derived in this study. It is desirable in such studies to enhance the representation of the respondents to include all clusters with equal weightage to both OEMs/ VAs and major suppliers. The interpretations of the findings of this study should take into account that this research was purely in an Indian context with its own unique business and cultural environment.

This study explored the risk management aspects in strategic sourcing. Further the focus of the study was limited only to the Indian automobile industry. The risk factors, the barriers and enablers studied are not exhaustive and can be further researched in order to present a more comprehensive picture.

This research may also have been affected partly by time-period bias and look ahead bias while considering the risk subfactors. For business risk, high-risk effect of demand volatility sub-factor is dominated by low credit risk possibilities and low R&D expenditure risk. For economic risks, its sub factors - India's high growth potential and booming index of industrial production have effectively brought down high-risk effects of exchange rate risk and country risk (from an import-export view). For external risks, low raw material risk has brought down high-risk probability of the sourcing/ supply network risk disruption. This is one of the drawbacks of constructing a very general, empirical model of a huge industry, where there are many complex factors in play.

8.5   Future Direction of Research

Adopting strategic sourcing practices without taking into consideration the operating environment and contextual factors may be counter-productive. For example, although most VAs in US and Europe followed the supplier relationship paradigm, first established by Japanese automakers such as Toyota and Nissan, often their expectations of performance enhancement fell short (Kamath and Liker 1994; Aspa, 2017). In the case of developing countries like India, sourcing/ procurement management in the manufacturing sector has its own peculiarities. A study by Mohanty and Gahan (2012) has brought out the fact that a majority of the suppliers in the manufacturing sector are MSMEs, who by their very nature of size and structure need much more understanding and even mentoring by the major manufacturers (buyers) than is prevalent in developed economics. In developing the framework, substantial amount of literature including the theoretical basis of SS and RM have been studied.

The identified constructs, indicators and their linkages have then been examined from the practical viewpoint, i.e. actual application of SSRM in the Indian automotive supply chain. However, there is a requirement for a wider scan of the sector involving other automotive clusters in India. It is suggested that as a first step in such studies, a pilot survey covering all automotive clusters be carried out to determine the antecedents of long term competitive advantage and the resulting benefits of SSRM. This wider coverage would neutralize any localized effects such as cultural practices in determining the factors and scale items and provide a strong foundation for further quantitative and qualitative analysis.

Also, it is highlighted that although this study, exploratory in nature, relied on literature in a global and the Indian context as also experience of practitioners and consultants, it is possible that some of the issues highlighted may be anecdotal in nature requiring a more rigorous empirical analysis. A case study, involving OEMs and its major suppliers, to delve into the antecedents, challenges and mutual benefits would add further value to such a study. Ultimate goal of attaining statistical beauty could be explained as the necessity of the final model to be theoretically sound, largely general in applicability and enable future research direction in the subject. It has been an endeavour of this study, especially in analysis of the model adopted to meet the objectives. However, there remains the issue of replication (Kline 2011) through other sample data taken from other automotive clusters. To strengthen the directional causality between constructs in the model under study, it is suggested that this model be subjected to testing through independent samples in different contextual settings.

Only a few studies (Johnston and Kristal 2008; Rungsithong et al., 2017) have considered perspectives of both buyers and suppliers in collaborative relationships in the manufacturing industry. Therefore, establishing determinants and indicators in a SSRM framework necessitates that a larger weightage be given to the suppliers' perspective since this would reveal "contrasting views" and "time-dependent trends" based on cross-sectional data (Stuart 1997; Kim and Chai, 2017) leading in turn to pragmatic recommendations for effective strategic sourcing. This issue can be addressed through longitudinal studies since a graded improvement in SSRM would be more prominent in emerging economies.

Risk sources affect each other and one risk gives rise to other risks also. Interaction among these can be studied and system perspective can be applied and detailed case studies can be worked out in future. Influence of risk drivers on SSRM has been explored in this research. Interaction of risk drivers with others factors and how each of the drivers affect specific type of risk sources can be explored in future. There is a research opportunity in investigating the nature of interactions among complexity, focus on efficiency, dependence and node criticality, and the extent of these interactions, if any, as well as increase or decrease in severity of disruptions.

There have been a few research studies conducted in area of SSRM and supplier relationships in developing economies such as in Iran (Imanipour et al., 2012), Malaysia (Rahman 2008), South Africa (Naude and Badenhorst-Weiss 2012), Turkey (Wasti et al., 2006) and Brazil (Vanalle and Salles 2009). These studies are characterized by a rapid growth phase, tie-ups with

global auto component manufacturers, enhanced competitiveness and favourable government policies. However, due to the evolving nature of this sector, the extent and depth of the SSRM practices in a holistic manner requires to be studied continuously and multi-dimensionally for meaningful recommendations for improvement.

8.6   Conclusion

This study has sought to present a holistic framework and a model for future examination of issues that need to be considered by Indian automobile industry stakeholders in embarking upon an effective roadmap that seeks to bridge the gap between theoretical perspectives and practical implementation of SSRM in the Indian automotive industry. It is envisaged that this study would provide a very sound basis for understanding the practical issues and challenges in implementation and enhancement of SSRM in automobile industry supply networks, not only in India but also in other such emerging markets.