

Analysis of Barriers and Risks in Green Textile and Clothing Supply Chain

ABSTRACT

Textile and clothing supply chain is one of the most important supply chains in developing economies like India as it provides huge employment generation opportunities. Textile and clothing industry consumes huge amount of resources (air, water and energy) and creates environmental pollution. Therefore, sustainable and green aspects of textile and clothing supply chain have attracted the attention of researchers, practitioners and policy makers. This research focusses on the two related aspects, namely barriers and risks of green supply chain management (GSCM) in Indian textile and clothing industry.

Interpretive structural modelling, fuzzy Analytic Hierarchy Process and fuzzy TOPSIS have been used as decision making tools for analysis of barriers, quantification of risks and prioritisation of risk mitigation strategies. First, an attempt has been made to identify and analyse the important barriers of GSCM in textile and clothing industry. For organised sector, lack of consumer support and encouragement, lack of guidance and support from regulatory authorities, and high implementation and maintenance cost are the major inhibiting barriers. Lack of green suppliers is the most dependent barrier which is influenced by most of the other barriers. In the unorganised sector, complexity of green process and system design along with lack of support from regulatory authorities are found to be the barriers having the maximum driving power. Lack of consumer support and high investment and low economic benefits are also found to be important inhibiting barriers. It is observed that the driver barriers are similar for organised and unorganised textile and clothing supply chains.

Then, an effort has been made to quantify various risks related to GSCM in textile and clothing industry based on their severity of impact and probability of occurrence. Business environment and financial risks have higher impact and their combined impact is around 60%, while remaining 40% is contributed by supply, demand and process risks. Among the specific risks, sourcing of funds, change in legislation, natural disaster and exchange rate fluctuation are having high impact on green clothing supply chain performance. In terms of probability of occurrence, the scenario is quite different as supply, demand and process risks dominate over the business environment and financial risks. Uncertainty of demand, cost of green materials, supplier failure and technological changes are the specific risks having high probability of

occurrence. In terms of integrated score, which combines severity of impact and probability of risk, sourcing of funds, change in legislation, fluctuation of exchange rate and key customer failure are the top four specific risks. A portfolio of risk mitigation strategies for GSCM in textile and clothing industry has been developed. It is found that developing agility in supply chain is the most potent strategy for risk mitigation. Multiple green sourcing with flexible capacities is the second dominant risk mitigation strategy, followed by adoption of the green initiatives (3rd), trust building and collaboration (4th) and alignment of economic incentives and revenue sharing (5th).

In the last part of this research, a case study of textile wastewater treatment plant installed in a vertically integrated textile unit located in Gujarat, India has been presented. Net present value (NPV) method has been used to analyse the investment economics considering different rates of discount. It is found that unless the capacity of waste water treatment plant is utilised fully, it becomes unviable in economic terms.