

ABSTRACT

The doctoral work reported in this thesis has linked two major developments that the world has been witnessing during the recent years. One of these developments is the implementation of supply chain management (SCM) by the manufacturing organisations. Another development is the application of risk management (RM) principles for achieving loss reduction in the supply chains of manufacturing organisations. As a result, during the recent period, supply chain risk management (SCRM) initiatives are increasingly applied informally in manufacturing organisations. Yet, the fruitfulness of SCRM initiatives in manufacturing organisations is not adequately nourished along the supply chains. This is due to the reason that the currently adopted informal SCRM initiatives do not adequately identify and address the loss producing events (LPEs) actually happening along the supply chains of manufacturing organisations. Hence, creation of dynamic SCRM in modern manufacturing organisations has been necessitated.

In order to create dynamic SCRM in manufacturing arena, in this doctoral work, a model named as responsive supply chain risk management model (RSCRMM) based on SCRM practice has been developed. There are many time delays and their associated LPEs are occurring in the supply chain activities of manufacturing organisations. RSCRMM facilitates the minimisation of losses occurring due to major time delays and associated LPEs occurring along the supply chains of manufacturing organisations. RSCRMM is incorporated with a framework to identify and estimate the

major time delays and their associated reasons of LPEs in the supply chain activities with SCRM practice. In a nutshell, RSCRMM is a diagnosis and decision based framework for enabling continuous performance improvement through the reduction of major time delays and LPEs along the supply chains of manufacturing organisations.

In order to validate RSCRMM, the major time delays of the supply chain activities in two typical Indian manufacturing organisations which are associated with the manufacturing of paint and automobile components were investigated through its application. In the paint manufacturing organisation, RSCRMM was applied to reduce the major time delays and its associated LPEs occurring along its supply chain. In this investigation, loss per litre of paint manufactured was used as a measurement tool for assessing the loss reduction and a risk management technique (RMT) namely Fault Tree Analysis (FTA) was used as an analysis tool. After investigating the reasons of LPEs and their root causes, suitable corrective measures were evolved and implemented. The sensitivity analysis was also performed to understand the effect and track the various major time delays and their associated LPEs occurring in the supply chain of the paint organisation. Further, education and training programme on RSCRMM was conducted to create awareness about the real time implementation, reduce major time delays, their associated LPEs and subsequently avoid them in future. Though there was a need to spend marginal amount to apply RSCRMM, considerable loss reduction was realised. Similar investigation on RSCRMM conducted in the automobile manufacturing organisation resulted in sufficient reduction in major time delays with marginal increase in recurring expenditure, loss reduction and process improvement.

After conducting investigations on RSCRMM, an information based proactive decision support system (IPDSS) was designed and developed. IPDSS was developed as a combination of data and model driven system where the requirements of the RSCRMM and the steps needed for SCRM practice were stored in the database. Weightings were given to time delays based on their frequency of occurrence and cost consequence. In order to validate IPDSS, an exclusive case study in a spring manufacturing organisation was carried out. On behalf of this spring manufacturing organisation, the author of this thesis entered the related data and information in IPDSS. These data and information were stored by IPDSS in its database. Subsequently the overall report, loss computations and comparisons were generated by IPDSS which indicated the achievement of substantial loss reduction and continuous performance improvement in the spring organisation, as the results of implementing RSCRMM..

The RSCRMM contributed in this doctoral work was found to improve the performance of manufacturing organisations through the reduction of major time delays, its associated LPEs and their root causes. Thus, the development of RSCRMM resulted in the fulfilment of the major objective of this doctoral work which was to create dynamic SCRM in manufacturing arena through the contribution of an appropriate model. The development of IPDSS was found to be highly useful in reducing paper based record-keeping, achieving loss reduction, futuristic SCRM initiatives and continuous performance improvement. Thus manufacturing organisations can reap significant benefits by implementing the developed RSCRMM and IPDSS.