Abstract

Adoption and implementation of sustainable supply chain practices creates a competitive advantage to organizations. Initially the scope of competition is limited to economic performance. However, increased globalization, climate change, ethical practices, government regulations and pressures from stakeholders are caused organizations to extend from economic performance to environmental and social performance (i.e triple bottom line (TBL)) approach.

In the present era, to compete in the global market, the automobile companies are becoming increasingly aware about the importance of sustainability and its benefits. For successful implementation of sustainability practices, practitioners required right assessment methods and implementation guidelines. Though there are assessment frameworks are available in literature, there is a lack of integrative (TBL) assessment of sustainability approach in supply chain. This research mainly deals with assessment and implementation phases of sustainability in automobile supply chain.

In the assessment phase, initially a composite sustainable supply chain performance index (CSSCPI) is developed using an integration of fuzzy analytical hierarchy process, Liberatore score and signal-to-noise ratio methods. The proposed methodology demonstrates how quantitative inputs can be combined with expert opinion to construct an overall index of sustainability. A company's sustainable supply chain performance is not only related to its supply chain processes, but also it is affected by the product. For automobile industry, product life cycle (PLC) stages (design, manufacturing and vehicle use) and sustainability competencies are closely associated. For this an integrated framework (TBL-PLC) is developed using Decision Making Trial and Evaluation Laboratory (DEMATEL), Analytical Network Process (ANP) and pre-emptive goal programming (PGP) model for identifying key sustainability measures contributing towards sustainability across product life cycle stages. Proposed assessment methodologies are demonstrated with the case studies.

In implementation phase, initially, a detailed empirical study is conducted to analyze the impact of sustainable supply chain practices on supply chain performance. Subsequently, this study has investigated the impact of environmental and social performance on economic performance.

For this purpose, structural equation modelling technique is used to build the measurement and structural models.

A system dynamics model is developed to depict the dynamic interaction among the sustainable supply chain variables such as supporters, barriers and benefits. Subsequently, scenario and sensitivity analysis is carried out to identify the key variables that need to be focused in long-term for successful implementation of sustainable practices.

Finally, Critical Success Factors (CSFs) are identified based on the organizational theory and modelled them using Interpretive Structural Modelling (ISM) technique for successful implementation of sustainability in supply chain. Further, the importance of CSFs has been determined based on their driving and dependence power using Matriced Impacts'croises-multipication applique' and class-ment (MICMAC) analysis.