Critical Success Factors of Sustainable Manufacturing and Procurement: An Empirical Study

Alok Khatri, Govt. Engineering College, Ajmer, India
D. Garg, National Institute of Technology, Kurukshetra, India
G. S. Dangayach, Malaviya National Institute of Technology, Jaipur, India

ABSTRACT

All countries are taking action and making plans for sustainable manufacturing and procurement so that the coming generations could not blame them for exhausting all available resources. In this study, significant variables of sustainable manufacturing for Indian manufacturing industries have been identified. The result of present study revealed that agile manufacturing has the highest impact on sustainable manufacturing followed by lean manufacturing and sustainable procurement and other variables. The outcome of results suggests that the government should be strict towards the implementation of sustainability norms in manufacturing industries and financial assistance should be provided by the government for better implementation of sustainability. A research framework has been developed and a regression equation for sustainable manufacturing has been developed in present paper using a stepwise linear regression analysis. The present article also explores the suitability of artificial neural network in order to identify the importance of studied variables.

KEYWORDS

Agile Manufacturing, Lean Manufacturing, Linear Regression, Neural Network, Sustainable Manufacturing, Sustainable Procurement

1. INTRODUCTION

In the era of globalization, the level of competition and environment pollution has been increased. The industrialization era has eased the lifestyle on the cost of natural resources. Increasing level of pollution, increasing global temperature, reducing green land are the main motivators of sustainability earlier it was considered as optional aspect but now it become essential for survival of world. Sustainable manufacturing considers use of reusable, recyclable material with less energy consumption in production to develop a high-quality product reaching to end user with minimum damage to environment. Saving of resources is same as producing of resources. Sustainable manufacturing system is balance between economics and ecology. Environmental commitments are not only regulatory compulsion but a competitive advantage (Carter et al., 2000).

Zhu and Sarkis (2004) found positive relationship between the adoption of sustainable practices and improvement in firm’s financial performance and environmental performance. According to Haapala et al. (2013) sustainable manufacturing require simultaneous deliberation to environment, economy, and social implications linked with the production and delivery of product. Lu et al. (2010)
considered environment impact, economic cost, energy consumption, worker safety, worker health and waste management as the potential sustainable process metrics. The total environment footprint has been measured by many ways by researchers. The life cycle assessment (LCA) has been undertaken by many researcher to measure sustainability of product. Gäbel and Tillman (2005) assessed LCA in cement production plant. Kheawhom and Hirao (2004) in phenolic-resin manufacturing and many other sectors has been analyzed on LCA basis. Seliger, (2007) argued that higher standard of living within ecological limit is possible with higher use of resource productivity. Jovane et al. (2008) highlighted necessary steps and strategy for competitive sustainable manufacturing.

In India, the sick industries are increasing day by day at high rate due to their loss of competitiveness. Therefore, the need of one promising manufacturing system has become essential for the survival of sick, small and medium scale industries, and also to save natural resources of the country. Researchers have been observed that sustainable manufacturing and procurement increased firm’s competitiveness, financial and environmental performance. Therefore, sustainable manufacturing system may give them better solution to deal with challenges. The sustainable manufacturing system may strengthen the competency of Indian manufacturing industries as well as saves our resources. The main focus of an industry is to gain profit using fewer resources. Sustainable manufacturing is a paradigm that provides a firm not only profit but also a social image. Therefore, managers need to focus on sustainability to improve their competitiveness and contribution to the society.

Many researchers have developed different manufacturing models in contrast to sustainability in last two decades and majority of their research concerned with different prime factors using ISM, AHP, ANP etc as observed from available literature. Till date very limited work has been reported on assignment of ranking/priorities of prime factors of sustainability in Indian manufacturing industries. Present work mainly deals with assignment of priorities using artificial neural network which found almost absent in available literature. Therefore, study has been conducted in Indian manufacturing industries to identify main predictors of sustainable manufacturing also to identify parameters of high impact using artificial neural network.

The aim of study was to develop an empirical model of sustainable manufacturing considering all dimensions of sustainability. A theoretical model of sustainable procurement has been developed to show all dimensions of sustainable procurement. Starting from the general understanding of sustainability, sustainable manufacturing and procurements, literature review on these issues are presented in section 2, then research methodology has been discussed in section 3, research hypotheses has been presented in section 4, and statistical analysis has been presented in section 5. Finally the study has been summarized in the section 6.

2. LITERATURE REVIEW: SUSTAINABLE PROCUREMENT AND MANUFACTURING

In any organization sustainable procurement leads it towards sustainability. Sustainable procurement provides recycling, reuse and many more environmental advantages (Klassen and Vachon, 2003; Guenther et al., 2010). Sustainable procurement in public sector has been addressed by many researchers. Edler and Georgiou (2007) argued that public demand should be taken as concretely. Public sector food procurement was undertaken by Rimmington et al. (2006). On the basis of available models in literatures, a model has been developed for sustainable procurement. Raj et al. (2010) observed that policy makers have to develop mechanism to conserve resources.

Four components such as customer awareness; cost and material management; manufacturing and technological aspects and social and legislative control has been considered as main dimensions of sustainable procurement as shown in Figure 1. Organizations should make procurement decisions considering the social and environment aspects.
Securitization of the Arctic: A Need for a Regional Security Architecture
www.igi-global.com/chapter/securitization-of-the-arctic/218607?camid=4v1a

Business Model Innovation in the Agri-food Sector
www.igi-global.com/article/business-model-innovation-in-the-agri-food-sector/152217?camid=4v1a