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ORIGINAL PAPER

Development of decision support system for sustainability evaluation: a case study

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Abstract The industries have created threat to the present environment through their manufacturing methods. Moreover, the excessive utilization of natural resources have led to scarcity and triggered danger for the future generations. So there exists a vital need for the modern companies to renovate their manufacturing technologies. Thus, a new concept of manufacturing process known as sustainable manufacturing has been introduced and it gained great importance in the present scenario. Sustainable manufacturing means the production of goods in such a way that it utilizes minimum natural resources and produces safer, cleaner, and environment-friendly products at an affordable cost. The purpose of this article is to assess the sustainability level of a manufacturing organization taking into consideration various factors needed for insuring sustainability. During the course of this research, a sustainability model was developed using fuzzy logic and the sustainability index was calculated. Manual calculation of sustainability index consumes more time and it is mistake prone. So, in order to avoid such inadequacies, a computer-based decision support system was developed designated as fuzzy-logic-based sustainability evaluation decision support system. The system calculates the fuzzy logic sustainability index, Euclidean distance, and fuzzy performance importance index. This model will help the companies to analyze various aspects of sustainability within their organization and work toward further improvement of it.

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Introduction

The modern manufacturing organizations are forced to adopt sustainable manufacturing principles due to regulations enforced by Government policies. As a sequel to it, the need for developing environmentally friendlier products arises. Sustainability includes environmental, economic, and social dimensions. Hence, the assessment of sustainability must be a comprehensive and holistic approach. Due to the drawbacks associated with traditional methods, the usage of fuzzy methods gains importance. Hence, the requirement for fuzzy-based sustainability evaluation was realized. Due to the complexity associated with fuzzy-based sustainability evaluation, fuzzy-logic-based sustainability evaluation decision support system (FLBSE-DSS) was designed and deployed in our study. The novelty of the study reported in this article is the development of exclusive DSS for sustainability evaluation in a fuzzy environment. Also, the practical feasibility of the developed DSS was test implemented in a real time manufacturing environment. The conceptual features and working mechanism of FLBSE-DSS will be presented in this article.

Literature review

The literature has been reviewed from the perspectives of sustainability evaluation, fuzzy logic, and DSS applications in sustainability.