NSWA Neutrosophic Systems with Applications, Vol. 4, 2023
https://doi.org/10.61356/j.nswa.2023.14

Neutrosophic MARCOS in Decision Making on Smart Manufacturing System

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Abstract: Business firms prefer software-based smart manufacturing systems to monitor and supervise all production activities in a decentralized manner. The choice of software decides the degree of manufacturing robustness. This paper proposes a neutrosophic-based MARCOS (Measurement of Alternatives and Ranking according to COmpromise Solution) method of MCDM with single-valued triangular neutrosophic numbers to solve the software selection problem. The proposed neutrosophic method is applied to hypothetical data to test the efficacy of the method. The results obtained using the proposed method are compared with crisp, fuzzy, and intuitionistic data representations, and suitable inferences are acquired. The proposed method has several industrial implications and it has several scope of applying to other decision-making scenarios with real data sets.

Keywords: Neutrosophic MCDM; MARCOS; Software; Smart Manufacturing.

1. Introduction

The manufacturing system concerned with any business is twined with the complexities of planning, managing, executing, reviewing and redoing. The traditional system of governing the manufacturing process is manual based and presently it is getting replaced with digital channels of administration in this contemporary era. The business firms are embracing different technologies to govern their production activities. Software based system of managing the process of manufacturing is the highlight of smart manufacturing systems. The choice making of the software is based on several deciding factors. This decision making problem based on several criteria shall be solved using the techniques of decision making.

Decision making is a process encompassing different decision making units of alternatives and criteria. The multi criteria decision making methods are generally applied both to determine the criterion weights and to rank the alternatives. The MCDM methods are broadly classified based on the number of alternatives, data types, hybrid nature and analysis. The two classifications based on the number of alternatives are multi-purpose and multi – qualified. The MCDM methods that fall under the multi-purpose category are vector optimization, goal programming, fuzzy based programming, dynamic programming, multi-stage programming, De nova programming and data envelopment analysis. The methods belonging to the multi-qualified category are AHP, ANP, TOPSIS, ELECTRE, PROMTHEE, DEMATEL. The three classifications of MCDM methods based on data types are Elementary, Unique synthesis criterion and outranking. This classification is also referred to as simple, original and distinguished methods. Hybrid MCDM methods evolve by