

## Guest Editorial Preface

# Special Issue on Recent Trends in Intelligent Decision-Making Approaches for Sustainability Modeling

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### 1. INTRODUCTION

The act of making decisions is becoming an art in most global organizations. Especially, in engineering and business areas, it is an advantage to use methodologies that help and support decision-making, reducing the complexity of the problems and the risks inherent in this process. Many firms and organizations may face the problem of evaluating and choosing between several options. Each kind of decision-making problem is designed in the context of different variables, goals and constraints. In a strategic decision environment, policy makers working to find the optimal solution have to rely on the optimality and effectiveness of the outcomes. The question is the way of utilizing these tools together and participating in an effective decision procedure. Over time, intelligent decision-making approach were grown and developed in depth.

Among operation research (OR) sub disciplines, decision analyses have gained crucial importance in economics and are widely recognized as a sound prescriptive theory. Precisely, Multiple criteria decision-making (MCDM), is most directly characterized by a set of multiple criteria methods and is a famous sub-discipline of the operation research. It analyzes and selects alternatives under several criteria in real world applications. It is a systematic quantitative approach, which aims to support decision makers in order to make rational and efficient decisions by considering important objectives and criteria. The concern of the experts and researchers is that each method might not be convenient to every problem, and so how to handle such condition and based on what regulations.

Sustainability modeling issues for diverse range of engineering applications have received an extensive grow in the last twenty years. Sustainability aims to conserve energy and natural resources, and to ensure that they have minimal impact on the environment and society. This tends the researchers to explore various phases and bring societal outcomes which benefit the country and residents. It targets at fulfilling the needs of the present without compromising the ability of future generations to meet their own needs. Discussions about the implementation of green strategies may lead to affordable product price, faster time-to-market, higher quality, and advantages relative to enterprise competition. Investigators in area of engineering and design seek to demonstrate advanced tools and models rather than relying on classical and trial and error methods in order to enhance quality of engineering process and productivity. Real-world decision-making problems often require the consideration and analysis of a group of criteria that affect the final evaluation. As criteria are frequently conflicting in nature, decision makers need a scientific approach to conduct such complex analyses. Therefore, the use of

intelligent MCDM models has gained considerable attention in both academia and practice to solving such real time industrial problems. The emergence of the intelligent decision-making technology provides a good decision support to deal with these complex decision-making problems.

From the 1950s onwards, there had been a large number of refined MCDM methods developed and they differ from each other in not only the required quality and quantity of additional information, but also in the methodology used; the user-friendliness; the sensitivity tools used; and the mathematical properties they verify. Many decision-making approaches were designed for sustainability measuring and analysis because of the multi-dimensionality of the sustainability goal and the complexity of socio-economic and biophysical systems. Therefore, based on the above foundations, we invited authors to submit innovative research articles to explore new proposals related to MCDM methods to rationalize the process of optimal decision-making. Out of a number of submissions, after peer review process, reviewers and editors approved 11 papers from all the received submissions which will be divided in two issues. The next section presents a brief discussion on the contributions of the approved papers centering to the aim of the Special Issue.

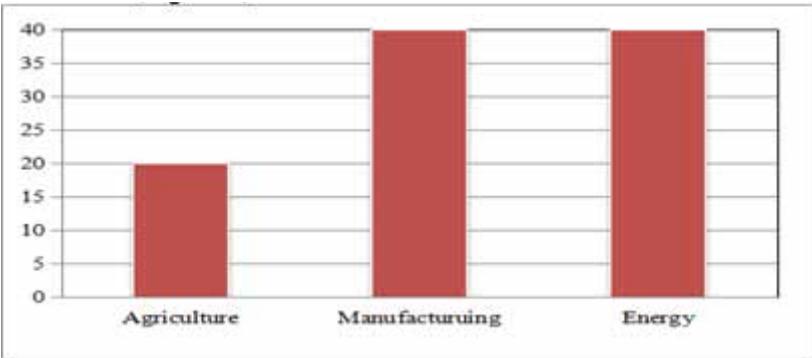
## 2. CONTRIBUTIONS

The Special Issue approved 5 original contributed articles for the first part. The papers focused on applications of MCDM methods in a diverse range of domains including selection of green energy sources, social, environmental and economic impacts of adopting clean energy, Micro-EDM process of D3 die-steel, Agricultural and Wire-EDM machining for Ti-6Al-4V alloy.

The papers considered the applications of technique for order of preference by similarity to ideal solution (TOPSIS), multi-objective optimization of simple ratio analysis (MOOSRA), complex proportional assessment (COPRAS), decision making trial and evaluation laboratory (DEMATEL), revised DEMATEL, Best Worst Method (BWM) and grey relational analysis (GRA) for different applications. The case studies and applications presented in the papers are mainly concentrated in three areas (Figure 1).

The Special Issue received a paper focusing on combined application of TOPSIS, MOOSRA and COPRAS methods to evaluate green energy sources. In another paper, impact of environmental, economic and social parameters on the use of renewable energy sources was studied using DEMATEL and revised DEMATEL techniques. One paper made an attempt to carryout experimentation during sustainable micro-EDM process of D3 die-steel employing NaNO<sub>3</sub> salt mixed deionised water. Taguchi-GRA (gray relational analysis) based experimental scheme and optimization technique was applied for analyzing different process parameters. A paper proposed the use of Best Worst Method (BWM) to evaluate different rice farming processes, occupational disorders and discomforts,

Figure 1. Percentage distribution of papers according to application domain



respectively. examine the influence of Wire Electric-discharge Machining (WEDM) parameters on performance parameters to improve the productivity with a higher surface finish of Titanium alloy (Ti-6Al-4V) by using adaptive Neuro based fuzzy interference (ANFIS) model and GRA method.

### **3. CONCLUSION**

The topics of the Special Issue raised interest among a number of researchers in the first Issue, thus establishing the acceptability of MCDM methods for complex selection problems.

The application areas of proposed MCDM techniques mainly covered green and clean energy sources, manufacturing and agricultural sector.

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