Editorial

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The objective of multi-criteria decision analysis in manufacturing systems (MCDAMS) is to help decision-makers to make better decisions. The MCDAMS concepts, models and procedures have to be seen as keys capable of opening doors giving access to better solutions. Management decisions will typically involve consideration of a much wider range of criteria, especially when consensus needs to be sought across widely disparate interest groups.

Thus, MCDAMS will give the satisfying answer, which may often be the right one, will provide an objective analysis, which will relieve decision-makers of the responsibility of making difficult judgments, and will take the pain out of decision-making. In other words, MCDAMS is a discipline intended to support decision-makers faced with making numerous and sometimes conflicting evaluations. MCDAMS aims at highlighting these conflicts and deriving a way to come to a compromise in a transparent process.

There are many MCDAMS methods in use today. These models are being used to deal with decision problems in various areas, such as manufacturing systems, service systems, project management, etc. Each approach needs different inputs and computational requirements leading to different forms of outputs, which also need different means of interpretation. Therefore, choosing the best MCDAMS is itself a multi-criteria decision-making problem.

This Special Issue aims to impart and share the recent research, development and applications dealing with engineering, technology and management aspects of manufacturing systems. From the past literature survey, it is evident that in recent years, many manufacturing organisations have adopted number of manufacturing strategies to improve the efficiency of the various sub-systems of the production systems to gain an edge in the increasingly competitive market. The decision of which manufacturing strategy to choose is a complex strategic question and calls for evaluating trade-off between multiple conflicting criteria, involving capacity, manpower, machine investment, material trade-off, money trade-off, flexibility, etc. Similarly, there are situations in tactical and operational decisions too, where the application of MCDM may become very relevant. Thus, the Special Issue disseminates discussion and exchange global experience in applying multi-criteria decision support models and methods emphasising on how to

design, run, control and optimise manufacturing systems. The focus is also on sharing innovative approaches that are relevant to the sustainable development of manufacturing sector in the global context.

The first paper, authored by Maleki and Saadat, presents the comparison of failure mode and effects analysis using analytical hierarchy process (AHP) and the REMBRANDT system. They considered it as a multi-criteria decision-making technique in terms of three different criteria: occurrence, severity and detection. They used the proposed method in the context of hydraulic gear pump manufacturer. They highlighted the fact that the rank reversal phenomenon occurs in the AHP, but this is not a perfectly valid phenomenon in REMBRANDT system and ranks will be preserved.

Ilangkumaran, Avenash, Balakrishnan, Kumar and Raja present, in the second paper, an application of multi-criteria decision-making techniques to evaluate optimum material to be employed for manufacturing of automobile bumper. The proposed model involves fuzzy analytical hierarchy process (FAHP) integrated with preference ranking organisation method for enrichment evaluation (PROMETHEE), where FAHP is used to compute the criteria weights. PROMETHEE is used to find the total ranking of the materials in consideration. They have the focus on five alternatives such as polyethylene, polypropylene, acrylonitrile butadiene styrene, polyamide and polystyrene. They used six evaluation criteria such as compressive yield strength, flexural modulus, hardness, Charpy's impact strength, elongation and cost to select the appropriate material.

As presented by Sangwan in the third paper, the growing awareness of environmental issues, business and government have come under increasing pressure to reduce the global environmental impacts. It is also evident that the evaluation of manufacturing systems from environmental perspective has often been neglected partly because of multifaceted criteria. This paper presents a multi-criteria decision model for the evaluation of manufacturing systems based on environmental aspects of the manufacturing system. The methodology has been validated by a case study of Indian industry.

In the fourth paper by Ateekh-Ur-Rehman and Al-Ahamri, the objective is to help the decision-makers to ensure that the selected industrial robot complies with the objective of the organisation. The paper mainly demonstrates and compares the ranking of the industrial robots using AHP and elimination and choice-translating algorithm. These approaches are considered for the assessment and ranking of advanced industrial robot for a given industrial organisation in Saudi Arabia.

Kabir and Hasin, in the fifth paper, present an MCDAMS approach to the inventory control and classification to have a significant influence on company competitiveness. The objective of their research is to develop a multi-criteria inventory classification model through integration of FAHP and artificial neural network approach. They implemented their model for 351 raw materials of switchgear section of Energypac Engineering Limited, a large power engineering company of Bangladesh.

Al-Zuheri, Xing and Luong, in the last paper, present a mathematical model that can be used by designers, manufacturers and dealers for an effective design that significantly affects the productivity and ergonomics performance measures. They compared different combinations of process design parameters, with several alternative scenarios of assembly line design using well-planned numerical experiments. Their objective is to help decision-makers to determine what types of policies for successful operation of walking worker assembly line system can quickly and economically be selected in light of the different levels of production demand.

The six papers presented in this Special Issue deal with various problems of manufacturing systems and also reflect to some extent the appreciation of the relevance of MCDM in various countries of the world.

We would like to thank the Editor-in-Chief of the *IJSIE* for his support and encouragement which helped us to take initiatives to announce this Special Issue and bring it to the current form. The editors are also thankful to all the reviewers, without whose cooperation, these six papers could not have been screened out of about 25 papers we received for the Special Issue. Finally, we would like to thank all the authors who responded to the call for papers, and the authors of the six papers published in this issue for allowing us to share the results of their research with the rest of the research community.