

Preface

Manufacturing is the backbone of any industrialized nation. The advancements in manufacturing technologies in the recent past have brought about a metamorphism in the world industrial scene. A long array of emerging technologies opened up the potential for a variety of new products. Fast changing technologies on the product front cautioned the need for an equally fast response from the manufacturing industries. To meet the challenges, the manufacturing industries have to select appropriate manufacturing strategies, product designs, manufacturing processes, work piece, and tool materials, machinery, and equipment, and so on. The selection decisions are complex as decision making is more challenging today. Decision makers in the manufacturing sector frequently face the problem of assessing wide range of alternative options and selecting one based on a set of conflicting criteria. Efforts need to be extended to identify the criteria which influence an alternative selection for a given problem under consideration, using simple, and logical methods, to eliminate unsuitable alternatives and selection of a most appropriate alternative to strengthen the existing selection procedures. Keeping in view of these aspects, I have previously authored a book entitled “Decision Making in the Manufacturing Environment Using Graph Theory and Fuzzy Multiple Attribute Decision Making Methods” published by Springer, London in 2007 and presented simple, systematic, and logical methods.

The book published in 2007 described the methodologies and applications of six MADM methods namely, graph theory and matrix approach (GTMA), Weighted Sum Method (WSM), Weighted Product Method (WPM), Analytic Hierarchy Process (AHP), Technique for Order Preference by Similarity to Ideal Solution (TOPSIS), and Compromise Ranking Method (VIKOR). However, other MADM methods such as Data Envelopment Analysis (DEA), Preference Ranking METHod for Enrichment Evaluations (PROMETHEE), ELimination Et Choix Traduisant la Réalité (ELECTRE), Complex PROportional ASsessment (COPRAS), UTility Additive (UTA), Ordered Weighted Averaging (OWA), etc., were not covered in the book. Hence, the proposed book, which can be considered as volume 2 of the first book, includes all these widely used MADM methods. The existing MADM methods are improved in this book by removing certain

deficiencies and incorporating certain changes. Furthermore, three novel multiple attribute decision making methods for solving the decision-making problems of the manufacturing environment are proposed. Of these, two methods namely, Subjective and Objective Integrated Weights (SOIW) method and the Weighted Euclidian Distance Based Approach (WEDBA) method consider the objective weights of importance of the attributes as well as the subjective preferences of the decision maker to decide the integrated weights of importance of the attributes. Furthermore, these methods use fuzzy logic to convert the qualitative attributes into the quantitative attributes. Various application examples are presented to illustrate the potential of the proposed methods. The “Combinatorial Based Mathematics Approach (CBMA)” proposed in this book combines the advantages of both GTMA with AHP methods.

The proposed book documents the latest research works including the author’s own works related to each of the listed topics. Furthermore, the book presents the real industrial case studies under each topic, results of application of the proposed methods, and the comparisons. The algorithms and computer programs for various MADM methods included in the book will be very much useful to the readers. The book will be very useful to the decision makers in the manufacturing sector as it makes decision making easier, logical, systematic, efficient, and effective.

The book is intended for designers, manufacturing engineers, practitioners, managers, institutes involved in design, and manufacturing related projects, applied research workers, academics, and graduate students in mechanical, industrial, and manufacturing engineering.

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While every attempt has been made to ensure that no errors (printing or otherwise) enter the book, the possibility of these creeping into the book is always there. I will be grateful to the readers if these errors are pointed out. Suggestions for further improvement of the book will be thankfully acknowledged.

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