

# Multi Criteria Decision Analysis

The book covers the domain of multi-criteria decision making, a topic which has gained significant attention of researchers and practitioners spanning a variety of disciplines for enhancing their decision making in real life situation. The topics in this volume help readers understand the techniques in the model building and analysis stage. The chapters cover a variety of techniques and their applications for interesting problems. This book will be of interest to readers in diverse disciplines such as engineering, business, management, humanities, psychology and law. ^

With contributions from some of the top academics and scientists in the field, *Advanced Studies in Multi-Criteria Decision Making* presents an updated view of the landscape of Decision Sciences, current research topics, the interaction with other sciences and fields, as well as the prospects and challenges at an international level. Given that Decision Sciences are recognized today as indispensable for confronting the major societal challenges in science and technology, this book would be of interest to decision-makers, managers, and researchers from academia, and industrial/services companies that would like a fresh insight into MCDM. Features Integrates a wide range of scientific fields with

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a general reader approach, including applied researchers from the social, business, enterprise sciences Suitable for academics and professionals Presents a broad coverage of MCDM tools either in industry or in services companies and systems Provides a fresh overview on MCDM studies promoted by prestigious R&D institutions

This book examines Multi-Criteria Decision Modelling (MCDM) methodologies and facilitates diverse ways for strategic decision-making in a variety of practical applications. This book also provides a pragmatic foundation for solving real-life problems in different scenarios of emerging global markets. Multi-Criteria Decision Modelling: Applicational Techniques and Case Studies depicts the use of sensitivity analysis and modelling and includes case studies to understand and illustrate challenging concepts. It also offers step-by-step comprehensive methodologies for the utilization of MCDM to a variety of situations. The book deliberates ways for companies to use these methods to their advantage in order to achieve sustainability. Furthermore, it also presents an overview of the major streams of thought and provides a holistic view of the latest research and development trends in modelling and optimization. FEATURES Offers a stepwise comprehensive methodology for the application of MCDM to a variety of situations Presents an overview of the major streams of thought present in the

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MCDM technique Provides a holistic view of the latest research and development trends in the emerging markets in terms of modelling and optimization using MCDM for different industrial sectors Illuminates a practical foundation in order to provide a guide to address the problems of emerging markets Enlightens the ways for companies to use these methods to their advantage to be able to achieve sustainability This book is a guide for those performing decision analysis for academic purposes as well as for researchers aspiring to expand their knowledge on MCDM problem solving.

This book intends to be a complimentary reference for graduate and undergraduate courses of Business and Engineering. Readers not familiar with Multi-Criteria Decision Making (MCDM) and supply chain management (SCM) may have a first glance, reading isolate chapters. Moreover, the sequential order from Chapters 1 to 8 may be more instructive. Readers with expertise on MCDM or SCM will find interesting applications or proposals. The book also presents a systematic literature review, which confirms the leadership of analytic hierarchy process (AHP) and data envelopment analysis (DEA).

Representing the first collection on the topic, this book builds from foundations to case studies, to future prospects, providing the reader with a rich and comprehensive understanding of the use of multi-criteria decision analysis

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(MCDA) in healthcare. The first section of the collection presents the foundations of MCDA as it is applied to healthcare decisions, providing guidance on the ethical and theoretical underpinnings of MCDA and how to select MCDA methods appropriate to different decision settings. Section two comprises a collection of case studies spanning the decision continuum, including portfolio development, benefit–risk assessment, health technology assessment, priority setting, resource optimisation, clinical practice and shared decision making. Section three explores future directions in the application of MCDA to healthcare and identifies opportunities for further research to support these.

This book examines multiple criteria decision making (MCDM) and presents the Sequential Interactive Modelling for Urban Systems (SIMUS) as a method to be used for strategic decision making. It emphasizes the necessity to take into account aspects related to real world scenarios and incorporating possible real life aspects for modelling. The book also highlights the use of sensitivity analysis and presents a method for using criteria marginal values instead of weights, which permits the drawing of curves that depicts the variations of the objective function due to variations of these marginal values. In this way it also gives quantitative values of the objective function allowing stakeholders to perform a comprehensive risk analysis for a solution when it is affected by exogenous

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variables. Strategic Approach in Multi-Criteria Decision Making: A Practical Guide for Complex Scenarios is divided into three parts. Part 1 is devoted to exploring the history and development of the discipline and the way it is currently used. It highlights drawbacks and problems that scholars have identified in different MCDM methods and techniques. Part 2 addresses best practices to assure quality MCDM process. Part 3 introduces the concept of Linear Programming and the proposed SIMUS method as techniques to deal with MCDM. It also includes case studies in order to help document and illustrate difficult concepts, especially related to demands from a scenario and also in their modelling. The decision making process can be a complex task, especially with multi-criteria problems. With large amounts of information, it can be an extremely difficult to make a rational decision, due to the number of intervening variables, their interrelationships, potential solutions that might exist, diverse objectives envisioned for a project, etc. The SIMUS method has been designed to offer a strategy to help organize, classify, and evaluate this information effectively. This book presents an introduction to MCDA followed by more detailed chapters about each of the leading methods used in this field. Comparison of methods and software is also featured to enable readers to choose the most appropriate method needed in their research. Worked examples as well as the software

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featured in the book are available on an accompanying website.

The field of multiple criteria decision analysis (MCDA), also termed multiple criteria decision aid, or multiple criteria decision making (MCDM), has developed rapidly over the past quarter century and in the process a number of divergent schools of thought have emerged. This can make it difficult for a new entrant into the field to develop a comprehensive appreciation of the range of tools and approaches which are available to assist decision makers in dealing with the ever-present difficulties of seeking compromise or consensus between conflicting interests and goals, i.e. the "multiple criteria". The diversity of philosophies and models makes it equally difficult for potential users of MCDA, i.e. management scientists and/or decision makers facing problems involving conflicting goals, to gain a clear understanding of which methodologies are appropriate to their particular context. Our intention in writing this book has been to provide a comprehensive yet widely accessible overview of the main streams of thought within MCDA. We aim to provide readers with sufficient awareness of the underlying philosophies and theories, understanding of the practical details of the methods, and insight into practice to enable them to implement any of the approaches in an informed manner. As the title of the book indicates, our emphasis is on developing an integrated view of MCDA, which we perceive to incorporate both

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integration of different schools of thought within MCDA, and integration of MCDA with broader management theory, science and practice.

Information management is a common paradigm in modern decision-making. A wide range of decision-making techniques have been proposed in the literature to model complex business processes. In this Special Issue, 16 selected and peer-reviewed original research articles contribute to business information management in various current real-world problems by proposing crisp or uncertain multiple-criteria decision-making (MCDM) models and techniques, mostly including multi-attribute decision-making (MADM) approaches in addition to a single paper proposing an interactive multi-objective decision-making (MODM) approach. The papers are mainly concentrated in three application areas: supplier selection and rational order allocation, the evaluation and selection of goods or facilities, and personnel selection/partner selection. A number of new approaches are proposed that are expected to attract great interest from the research community.

This book presents various multi-criteria analysis methods for sustainability-oriented analysis and decision-making for energy systems, under various different conditions and scenarios. It presents methodologies to answer the questions relating to which of the options are the most sustainable among the alternatives, and how multi-criteria decision analysis methods can be used to select the most sustainable energy systems. A systematic innovative methodological framework is presented, which enables the

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most appropriate energy system to be selected under different conditions including: Scientific decision support tools for sustainable energy system selection; Fuzzy, grey, and rough sets based multi-criteria decision analysis; Decision-making models under uncertainties; and The combination of life cycle thinking and multi-criteria decision analysis This book is of interest to researchers, engineers, decision makers, and postgraduate students within the field of energy systems, sustainability, and multi-criteria decision analysis.

Providing useful insights on the use of Multi-Criteria Decision Analysis (MCDA) in natural resource management, this book examines a number of empirical applications for several countries and a variety of natural resources. It is shown that using MCDA in the management of water, forestry, wetland and other natural resources can substantially improve the design and implementation of natural resource and environmental policies. Stakeholder involvement is also an important determinant of successful resource management and MCDA provides a useful and effective framework for getting stakeholders involved in resource management decisions. Using Multi-Criteria Decision Analysis in Natural Resource Management gives in-depth analysis of the potential problems in applying these techniques, including difficulties eliciting required information, lack of suitable measures for environmental variables and the need to develop innovative methods to simplify the use of MCDA.

Applications of Multi-Criteria Decision-Making Theories in Healthcare and Biomedical

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Engineering contains several practical applications on how decision-making theory could be used in solving problems relating to the selection of best alternatives. The book focuses on assisting decision-makers (government, organizations, companies, general public, etc.) in making the best and most appropriate decision when confronted with multiple alternatives. The purpose of the analytical MCDM techniques is to support decision makers under uncertainty and conflicting criteria while making logical decisions. The knowledge of the alternatives of the real-life problems, properties of their parameters, and the priority given to the parameters have a great effect on consequences in decision-making. In this book, the application of MCDM has been provided for the real-life problems in health and biomedical engineering issues. Provides a comprehensive analysis and application multi-criteria decision-making methods Presents detail information about MCDM and their usage Covers state-of-the-art MCDM methods and offers applications of MCDM for health and biomedical engineering purposes

Environmental management is often complicated and multidisciplinary and the issues that arise can be difficult to solve analytically. Often, decision makers take ad hoc approaches, which may result in the ignoring of important stakeholder opinions or decision criteria. Multi-criteria decision analysis (MCDA) provides a framework by which these types of decisions can be made but, despite being used effectively in many fields, it is not often used in environmental management. Given the novelty and inherent

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applicability of this decision making framework to the environmental field, there is a need for more teaching tools for MCDA. In particular, there is a need for a case study based approach to help readers navigate the many MCDA methods and decide how to apply them to a specific case. Through a collection of case studies, *Multi-Criteria Decision Analysis: Environmental Applications and Case Studies* gives readers the tools to apply cutting-edge MCDA methods to their own environmental projects. It offers an overview of the types of MCDA available and a conceptual framework of how it is applied, with the focus on its applicability for environmental science. Taking an in-depth look at the case of sediment management, the book introduces different steps of MCDA processes from problem formulation and model development to criteria weighing and alternative scoring. The authors then explore the case using various MCDA methods, which allows readers to see clearly how the methodologies differ and gain a better understanding of the mechanistic operation of the analysis. A series of case studies in nanotechnology collectively demonstrate the application of MCDA in situations of high variability and uncertainty that require the integration of technical information and expert judgment in an area where MCDA clearly shines. The authors describe multiple decisions from risk classification to value of information analysis to the assessment of potential research and funding investments that readers may face in dealing with emerging environmental threats. Demonstrating the broad applicability of MCDA methods for different types of cases, the book presents a series of case studies ranging

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from oyster restoration to oil spill response. In conjunction with these cases, the book also provides corresponding decision models that are implemented by the DECERNS software and allow users to examine the same case using multiple MCDA tools. The DECERNS software and models are available for download at [www.crcpress.com](http://www.crcpress.com). Intended both as a research and teaching tool, this book inspires creative thinking when applying MCDA to complicated environmental issues.

Multi-criteria decision making (MCDM) has been extensively used in diverse disciplines, with a variety of MCDM techniques used to solve complex problems. A primary challenge faced by research scholars is to decode these techniques using detailed step-by-step analysis with case studies and data sets. The scope of such work would help decision makers to understand the process of using MCDM techniques appropriately to solve complex issues without making mistakes. Multi-Criteria Decision Analysis in Management provides innovative insights into the rationale behind using MCDM techniques to solve decision-making problems and provides comprehensive discussions on these techniques from their inception, development, and growth to their advancements and applications. The content within this publication examines hybrid multicriteria models, value theory, and data envelopment. Ideal for researchers, management professionals, students, operations scholars, and academicians, this scholarly work supports and enhances the decision-making process.

Decision analysis has become widely recognized as an important process for

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translating science into management actions. With climate change and other systemic threats as driving forces in creating environmental and engineering problems, there is a great need for understanding decision making frameworks through a case-study based approach. Management of environmental and engineering projects is often complicated and multidisciplinary in scope and nature, thus issues that arise can be difficult to solve analytically. Multi-Criteria Decision Analysis: Case Studies in Engineering and the Environment provides detailed description of MCDA methods and tools and illustrates their applications through case studies focused on sustainability and system engineering applications. New in the Second Edition: Addresses current and emerging environmental and engineering problems Includes seven new case studies to illustrate different management situations applicable at the international level Builds on real case studies from recent and relevant environmental and engineering management experience Describes advanced MCDA techniques and extensions used by practitioners Provides corresponding decision models implemented using the DECERNS software package Gives a more holistic approach to teaching MCDA methodology with a focus on sustainable solutions and adoption of new technologies, including nanotechnology and synthetic biology Given the novelty and inherent applicability of this decision-making framework to the environmental and engineering fields, a greater number of teaching tools for this topic need to be made available. This book provides those teaching tools, covering the breadth of the applications of MCDA

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methodologies with clear explanations of the MCDA process. The case studies are implemented in the DECERNS software package, allowing readers to experiment and explore and to understand the full process by which environmental managers assess these problems. This book is a great resource for professionals and students seeking to learn decision analysis techniques and apply similar frameworks to environmental and engineering projects

This book presents a broad range of innovative applications and case studies in all areas of management and engineering, including public administration, finance, marketing, engineering, transportation, and energy systems. It addresses issues related to problem structuring, preference modeling, and model construction, presenting a framework that provides clear decision-making support in practice. In addition, it includes hybrid and integrated techniques combining multiple criteria decision making (MCDM) with other analytical methods. The book reflects the growing impact of MCDM in the field of management science and operations research. Building on recent and established theoretical advances and presenting their applications in specific domains, it offers a comprehensive resource for researchers, graduate students and professionals alike.

Multiple Criteria Decision Making (MCDM) is all about making choices in the presence of multiple conflicting criteria. MCDM has become one of the most important and fastest growing subfields of Operations Research/Management Science. As modern MCDM

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started to emerge about 50 years ago, it is now a good time to take stock of developments. This book aims to present an informal, nontechnical history of MCDM, supplemented with many pictures. It covers the major developments in MCDM, from early history until now. It also covers fascinating discoveries by Nobel Laureates and other prominent scholars. The book begins with the early history of MCDM, which covers the roots of MCDM through the 1960s. It proceeds to give a decade-by-decade account of major developments in the field starting from the 1970s until now. Written in a simple and accessible manner, this book will be of interest to students, academics, and professionals in the field of decision sciences.

Ecosystem Services: Global Issues, Local Practices covers scientific input, socioeconomic considerations, and governance issues on ecosystem services. This book provides hands-on transdisciplinary reflections by administrators and sector representatives involved in the ecosystem service community. Ecosystem Services develops shared approaches and scientific methods to achieve knowledge-based sustainable planning and management of ecosystem services. Professionals engaged in ecosystem service implementation have two options: de-emphasize the ecological and socioeconomic complexity and advance in the theoretical, abstract field, or try to develop research that is policy relevant and inclusive in an uncertain environment. This book provides a wide overview of issues at stake, of interest for any professional wishing to develop a broader view on ecosystem service science and practice.

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Examines a broad scope of relevant issues to create common understanding in the ecosystem services community Includes contributions from several backgrounds, providing a broad, multidisciplinary view Offers recommendations to develop a thorough understanding and management of ecosystem services based on tools and research in larger territories as well as on local scales

First published in 1999, this volume consists of selected papers presented at the North American Meetings of the RSAI along with invited contributions from scholars active in the field of spatial multicriteria decision making and analysis. It is meant to present diverse lines of research in spatial multicriteria decision making and analysis under the multidisciplinary umbrella of Geographic Information Science. The first part explores selected theoretical and conceptual aspects of spatial multicriteria decision making and analysis not confined to any specific application domain. Part 2 consists of six chapters focusing on various forms of location decision and analysis problems. Finally, part 3 contains five chapters on various spatial decision problems whose systemic scope sets them apart from locational decision problems.

Multi-Criteria Decision Making (MCDM) has been one of the fastest growing problem areas in many disciplines. The central problem is how to evaluate a set of alternatives in terms of a number of criteria. Although this problem is very relevant in practice, there are few methods available and their quality is hard to determine. Thus, the question 'Which is the best method for a given problem?' has become one of the most important

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and challenging ones. This is exactly what this book has as its focus and why it is important. The author extensively compares, both theoretically and empirically, real-life MCDM issues and makes the reader aware of quite a number of surprising 'abnormalities' with some of these methods. What makes this book so valuable and different is that even though the analyses are rigorous, the results can be understood even by the non-specialist. Audience: Researchers, practitioners, and students; it can be used as a textbook for senior undergraduate or graduate courses in business and engineering.

This Brief highlights a novel model to find out the feasibility of any location to produce solar energy. The model utilizes the latest multi-criteria decision making techniques and artificial neural networks to predict the suitability of a location to maximize allocation of available energy for producing optimal amount of electricity which will satisfy the demand from the market. According to the results of the case studies further applications are encouraged.

In two volumes, this new edition presents the state of the art in Multiple Criteria Decision Analysis (MCDA). Reflecting the explosive growth in the field seen during the last several years, the editors not only present surveys of the foundations of MCDA, but look as well at many new areas and new applications. Individual chapter authors are among the most prestigious names in MCDA research, and combined their chapters bring the field completely up to date. Part I of the book considers the history and current

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state of MCDA, with surveys that cover the early history of MCDA and an overview that discusses the “pre-theoretical” assumptions of MCDA. Part II then presents the foundations of MCDA, with individual chapters that provide a very exhaustive review of preference modeling, along with a chapter devoted to the axiomatic basis of the different models that multiple criteria preferences. Part III looks at outranking methods, with three chapters that consider the ELECTRE methods, PROMETHEE methods, and a look at the rich literature of other outranking methods. Part IV, on Multiattribute Utility and Value Theories (MAUT), presents chapters on the fundamentals of this approach, the very well known UTA methods, the Analytic Hierarchy Process (AHP) and its more recent extension, the Analytic Network Process (ANP), as well as a chapter on MACBETH (Measuring Attractiveness by a Categorical Based Evaluation Technique). Part V looks at Non-Classical MCDA Approaches, with chapters on risk and uncertainty in MCDA, the decision rule approach to MCDA, the fuzzy integral approach, the verbal decision methods, and a tentative assessment of the role of fuzzy sets in decision analysis. Part VI, on Multiobjective Optimization, contains chapters on recent developments of vector and set optimization, the state of the art in continuous multiobjective programming, multiobjective combinatorial optimization, fuzzy multicriteria optimization, a review of the field of goal programming, interactive methods for solving multiobjective optimization problems, and relationships between MCDA and evolutionary multiobjective optimization (EMO). Part VII, on Applications, selects some

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of the most significant areas, including contributions of MCDA in finance, energy planning problems, telecommunication network planning and design, sustainable development, and portfolio analysis. Finally, Part VIII, on MCDM software, presents well known MCDA software packages.

This book provides a systematic way of how to make better decisions in water resources management. The applications of three weighting methods namely rating, ranking, and ratio are discussed in this book. Additionally, data mining on keywords is presented using three popular scholarly databases: Science Direct, Scopus, and SciVerse. Four abbreviated keywords (MCDM, MCDA, MCA, MADM) representing multi-criteria decision-making were used and these three databases were searched for different popular weighting methods for a period of 13 years (2000-2012). The book provides also a review of weighting methods applied in various multi-criteria decision-making (MCDM) methods and also presents survey results on priority ranking of watershed management criteria undertaken by 30 undergraduate and postgraduate students from the Faculty of Civil Engineering, Universiti Teknologi Malaysia. From selecting sites for new hospitals, schools, and factories, to managing forests and rivers, to creating and maintaining highways and bridges, public and private organizations are often called on to make decisions on geographic questions that involve a multitude of alternatives and often conflicting evaluation criteria. This book presents a formal mechanism for dealing with these situations, capturing the

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information in a Geographic Information System and processing it to derive optimal recommendations for confronting these complex questions.

Multiple Criteria Decision Making (MCDM) is the study of methods and procedures by which concerns about multiple conflicting criteria can be formally incorporated into the management planning process. A key area of research in OR/MS, MCDM is now being applied in many new areas, including GIS systems, AI, and group decision making. This volume is in effect the third in a series of Springer books by these editors (all in the ISOR series), and it brings all the latest developments in MCDM into focus. Looking at developments in the applications, methodologies and foundations of MCDM, it presents research from leaders in the field on such topics as Problem Structuring Methodologies; Measurement Theory and MCDA; Recent Developments in Evolutionary Multiobjective Optimization; Habitual Domains and Dynamic MCDM in Changeable Spaces; Stochastic Multicriteria Acceptability Analysis; and many more chapters.

The point of departure in the present book is that the decision makers, involved in the evaluation of alternatives under conflicting criteria, express their preferential judgement by estimating ratios of subjective values or differences of the corresponding logarithms, the so-called grades. Three MCDA methods are studied in detail: the Simple Multi-Attribute Rating Technique SMART, as well as the Additive and the Multiplicative AHP, both pairwise-comparison methods which do not suffer from the well-known shortcomings of the original Analytic Hierarchy Process. Context-related preference

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modelling on the basis of psycho-physical research in visual perception and motor skills is extensively discussed in the introductory chapters. Thereafter many extensions of the ideas are presented via case studies in university administration, health care, environmental assessment, budget allocation, and energy planning at the national and the European level. The issues under consideration are: group decision making with inhomogeneous power distributions, the search for a compromise solution, resource allocation and fair distributions, scenario analysis in long-term planning, conflict analysis via the pairwise comparison of concessions, and multi-objective optimization. The final chapters are devoted to the fortunes of MCDA in the hands of its designers. The research started in the late seventies, when I got involved in three different problems: the nomination procedures in a university, the evaluation of alternative energy-research proposals, and the evaluation of non-linear programming software. This book is intended for the GIS Science and Decision Science communities. It is primarily targeted at postgraduate students and practitioners in GIS and urban, regional and environmental planning as well as applied decision analysis. It is also suitable for those studying and working with spatial decision support systems. The main objectives of this book are to effectively integrate Multicriteria Decision Analysis (MCDA) into Geographic Information Science (GIScience), to provide a comprehensive account of theories, methods, technologies and tools for tackling spatial decision problems and to demonstrate how the GIS-MCDA approaches can be used in a wide range of planning

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and management situations.

This book provides in-depth guidance on how to use multi-criteria decision analysis methods for risk assessment and risk management. The frontiers of engineering operations management methods for identifying the risks, investigating their roles, analyzing the complex cause-effect relationships, and proposing countermeasures for risk mitigation are presented in this book. There is a total of ten chapters, mainly including the indicators and organizational models for risk assessment, the integrated Bayesian Best-Worst method and classifiable TOPSIS model for risk assessment, new risk prioritization model, fuzzy risk assessment under uncertainties, assessment of COVID-19 transmission risk based on fuzzy inference system, risk assessment and mitigation based on simulation output analysis, energy supply risk analysis, risk assessment and management in cash-in-transit vehicle routing problems, and sustainability risks of resource-exhausted cities. The most significant feature of this book is that it provides various systematic multi-criteria decision analysis methods for risk assessment and management, and illustrates the application of these methods in different fields. This book is beneficial to policymakers, decision-makers, experts, researchers and students related to risk assessment and management.

Multicriteria analysis, or MCA, has been increasingly used in environmental decision-making to support the identification of suitable courses of action by integrating factual information with value-based information collected through stakeholder engagement.

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Multicriteria Analysis for Environmental Decision-Making provides an introduction to the key concepts of MCA and includes a series of case studies that illustrate the application of MCA to a variety of environmental decision-making problems ranging from protected area zoning to landfill siting, and from forest restoration to environmental impact assessment of tourism infrastructures. A compact reference that can be used by researchers, practitioners and planners/decision makers, Multicriteria Analysis for Environmental Decision-Making can also serve as a textbook for undergraduate and postgraduate courses in a broad range of curricula.

Multiple Criteria Decision Making (MCDM) is a subfield of Operations Research, dealing with decision making problems. A decision-making problem is characterized by the need to choose one or a few among a number of alternatives. The field of MCDM assumes special importance in this era of Big Data and Business Analytics. In this volume, the focus will be on modelling-based tools for Business Analytics (BA), with exclusive focus on the sub-field of MCDM within the domain of operations research. The book will include an Introduction to Big Data and Business Analytics, and challenges and opportunities for developing MCDM models in the era of Big Data. Decision theory renders the human decision maker the centre of attention: observing, describing how he makes decisions and leading him by the hand in an attempt to prevent him from taking 'illogical' decisions. Literature and scientific publications on decision theory should be accessible and understandable to the average decision

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maker but this is almost never the case since these methods and models are too complex and/or require input from the decision maker which makes him feel uncomfortable. The result is that most decision makers turn their back on scientific approaches and prefer to use common sense and 'rules of thumb' when facing decision problems. To breach the current wide gap between decision makers and academic researchers a clear idea as to what a human decision maker is and is not capable of is needed. Based on these elements less sophisticated models need to be build. In this book, a KISS-principle is proposed and several methods in the field of decision making by one decision maker or by group, resulting from close contacts with real world decision makers, are presented. Field cases are used to illustrate the methods and a lot of application fields are presented.

"To all who love the God with a 1000 names and respect science" In the last quarter century, the academic field of Science and Theology (Religion) has attracted scholars from a wide variety of disciplines. The question is, which disciplines are attracted and what do these disciplines have to contribute to the debate? In order to answer this question, the encyclopedia maps the (self)-identified disciplines and religious traditions that participate or might come to participate in the Science and Religion debate. This is done by letting each representative of a discipline and tradition answer specific chosen questions. They also need to identify the discipline in relation to the Science and Religion debate. Understandably representatives of several disciplines and traditions

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answered in the negative to this question. Nevertheless, they can still be important for the debate; indeed, scholars and scientists who work in the field of Science and Theology (Religion) may need knowledge beyond their own specific discipline. Therefore the encyclopedia also includes what are called general entries. Such entries may explain specific theories, methods, and topics. The general aim is to provide a starting point for new lines of inquiry. It is an invitation for fresh perspectives on the possibilities for engagement between and across sciences (again which includes the social and human sciences) and religions and theology. This encyclopedia is a comprehensive reference work for scholars interested in the topic of 'Science and Religion.' It covers the widest spectrum possible of academic disciplines and religious traditions worldwide, with the intent of laying bare similarities and differences that naturally emerge within and across disciplines and religions today. The A–Z format throughout affords easy and user-friendly access to relevant information. Additionally, a systematic question-answer format across all Sciences and Religions entries affords efficient identification of specific points of agreement, conflict, and disinterest across and between sciences and religions. The extensive cross-referencing between key words, phrases, and technical language used in the entries facilitates easy searches. We trust that all of the entries have something of value for any interested reader. Anne L.C. Runehov and Lluís Oviedo

The purpose of this book is to provide a resource for students and researchers

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that includes current application of a multi-criteria, decision-making theory in various fields such as: environment, healthcare and engineering. In addition, practical application are shown for students manually. In real life problems there are many critical parameters (criteria) that can directly or indirectly affect the consequences of different decisions. Application of a multi-criteria, decision-making theory is basically the use of computational methods that incorporate several criteria and order of preference in evaluating and selecting the best option among many alternatives based on the desired outcome.

This book introduces students on Multiple Criteria Decision Aiding and Making courses to practical, real-world cases. Each case study introduces a problem or situation together with a method, and a description and explanation of a computer application. In this sense each chapter is based on four pillars: the problem, the model building, the methods and their implementation. The book presents and elaborates a rich and comprehensive set of practical problems comprising multiple criteria, including numerous approaches for their solution, for decision support or decision aid. It complements traditional textbooks and lecture material by employing case studies to promote a deeper understanding of the investigated concepts and help students apply these methods to other areas. Multi-criteria Decision Analysis Methods and Software John Wiley & Sons

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Multi-criteria Decision Analysis for Supporting the Selection of Engineering Materials in Product Design, Second Edition, provides readers with tactics they can use to optimally select materials to satisfy complex design problems when they are faced with the vast range of materials available. Current approaches to materials selection range from the use of intuition and experience, to more formalized computer-based methods, such as electronic databases with search engines to facilitate the materials selection process. Recently, multi-criteria decision-making (MCDM) methods have been applied to materials selection, demonstrating significant capability for tackling complex design problems. This book describes the rapidly growing field of MCDM and its application to materials selection. It aids readers in producing successful designs by improving the decision-making process. This new edition updates and expands previous key topics, including new chapters on materials selection in the context of design problem-solving and multiple objective decision-making, also presenting a significant amount of additional case studies that will aid in the learning process. Describes the advantages of Quality Function Deployment (QFD) in the materials selection process through different case studies Presents a methodology for multi-objective material design optimization that employs Design of Experiments coupled with Finite Element Analysis Supplements existing quantitative methods

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of materials selection by allowing simultaneous consideration of design attributes, component configurations, and types of material Provides a case study for simultaneous materials selection and geometrical optimization processes Sustainability issues have gained more importance in contemporary globalization, pushing decision makers to find a systematic mathematical approach to conduct analyses of this real-world problem. The growing complexity in modern social-economics or engineering environments or systems has forced researchers to solve complicated problems by using multi-criteria decision-making (MCDM) approaches. However, traditional MCDM research mainly focuses on reaching the highest economic value or efficiency, and issues related to sustainability are still not closely explored. Advanced Multi-Criteria Decision Making for Addressing Complex Sustainability Issues discusses and addresses the challenges in the implementation of decision-making models in the context of green and sustainable engineering, criteria identification, quantification, comparison, selection, and analysis in the context of manufacturing, supply chain, transportation, and energy sectors. All academic communities in the areas of management, economics, business sciences, mechanical, and manufacturing technologies are able to use, apply, and implement the models presented in this book. It is intended for researchers, manufacturers, engineers, managers,

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industry professionals, academicians, and students.

This book addresses the problem of waste management by using multi-criteria decision-making (MCDM) methods. The authors discuss how to apply MCDM, a complex decision-making tool that involves both quantitative and qualitative factors, to develop strategies for effective waste management using various optimization models to rank alternatives, while also incorporating the concerns and needs of multiple stakeholders to find the most optimal decisions for various types of wastes. Typically, there does not exist a single optimal solution to waste problems; with help of MCDM, far better solutions can often be found and utilized to facilitate sustainable waste management techniques in various industries. This book provides unique, effective, and quick decision-making strategies for waste management. With the ever-increasing population and continuing human development, the problem of managing waste becomes increasingly essential, and this volume helps lead the way to finding sustainable solutions.

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