Multiple Criteria Decision Making by Multiobjective Optimization: A Toolbox (International Series in Operations Research & Management Science)

By Ignacy Kaliszewski, Janusz Miroforidis, Dmitry Podkopaev

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This textbook approaches optimization from a multi-aspect, multi-criteria perspective. By using a Multiple Criteria Decision Making (MCDM) approach, it avoids the limits and oversimplifications that can come with optimization models with one criterion. The book is presented in a concise form, addressing how to solve decision problems in sequences of intelligence, modelling, choice and review phases, often iterated, to identify the most preferred decision variant. The approach taken is human-centric, with the user taking the final decision is a sole and sovereign actor in the decision making process. To ensure generality, no assumption about the Decision Maker preferences or behavior is made. The presentation of these concepts is illustrated by numerous examples, figures, and problems to be solved with the help of downloadable spreadsheets. This electronic companion contains models of problems to be solved built in Excel spreadsheet files.

Optimization models are too often oversimplifications of decision problems met in practice. For instance, modeling company performance by an optimization model in which the criterion function is short-term profit to be maximized, does not fully reflect the essence of business management. The company's managing staff is accountable not only for operational decisions, but also for actions which shall result in the company ability to generate a decent profit in the future. This calls for management decisions and actions which ensure short-term profitability, but also maintaining long-term relations with clients, introducing innovative products, financing long-term investments, etc. Each of those additional, though indispensable actions and their effects can be modeled separately, case by case, by an optimization model with a criterion function adequately selected. However, in each case the same set of constraints represents the range of company admissible actions. The aim and the scope of this textbook is to present methodologies and methods enabling modeling of such actions **jointly**.

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- Sales Rank: #5792557 in Books
- Published on: 2016-08-02
- Original language: English
- Number of items: 1
- Dimensions: 9.21" h x .38" w x 6.14" l, .0 pounds
- Binding: Hardcover
- 118 pages

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Ignacy Kaliszewski, Full Professor at the Systems Research Institute of the Polish Academy of Sciences, graduated from the Technical University of Warsaw. He got his Ph.D. and habilitation degrees from the Systems Research Institute of the Polish Academy of Science for his research in quantitative management science and operations research. He has published over 40 scientific papers in journals and books of international circulation and two monographs: Quantitative Pareto Analysis by Cone Separation Technique (Kluwer Academic Publ., Dordrecht, 1994), Soft Computing for Complex Multiple Criteria Decision Making (Springer, 2006). His current field of research is decision making in multicriteria environment.

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Dmitry Podkopaev is a Researcher and Associate Professor for the Systems Research Institute at the Polish Academy of Sciences. His interests include Multiple Criteria Decision Making and Discrete Optimization. He has experience in research and software development projects (as Analyst, Developer, Programmer), as well as high school teaching.

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