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BOOK REVIEWS

Metaheuristics for Business Analytics. A Decision Modeling Approach by Abraham Duarte, Manuel Laguna,and Rafael Martí. Springer International Publishing, Series: EURO Advanced Tutorials on Operational Research, 2018, 136 pp. Hardcover ISBN: 978-3-319-68117-7, eBook ISBN: 978-3-319-68119-1

Over the past two decades, the use of business analytics (BA) in organizations grew steadily until it became "a revolution that is impossible to miss" (Acito& Khatri, 2014). The first-order effects of business analytics on improvements of organizational performance are superior decision-making processes (Sharma, Mithas, &Kankanhalli, 2014). Those processes include problem solving activities that are necessary steps from BA use to organizational benefits from BA (Seddon, Constantinidis, Tamm, &Dod, 2017). In addition, these activities open up a wide area of academic research. However, the more sophisticated the research methods and techniques become, the more difficult their use for solving the practical BA problems proves to be. Consequently, the shortage of knowledge of analytics methods and approaches has grown into a key challenge to practitioners in their efforts to build business analytics and data driven organization (Vidgen, Shaw, & Grant, 2017). This makes the gap between researcher and practitioners bigger (Rynes, Bartunek, & Daft, 2001).

The book "Metaheuristics for Business Analytics. A Decision Modeling Approach" is a contribution to overcoming this gap, particularly in the field of prescriptive analytics - the final phase of BA which refers to solving optimization problems. The authors of the book are professors in the fields of operations research, statistics, and computer science and the members of the Optsicom project (Optimization of Complex Systems) that deals with the development of optimization tools based on metaheuristic procedures. Metaheuristics are efficient ways for solving hard optimization problems and, in addition to mathematical programming, most commonly published and surveyed approaches (Gorman, 2016). Since they represent a high-level algorithmic framework, the application of metaheuristics requires knowledge and experience in their design and implementation which make them difficult to use for the practitioners. This book introduces metaheuristics thought spreadsheet modelling and makes them more accessible to practitioners.

The book is organized in five chapters. The first chapter introduces the basic concepts of BA, describes its phases: descriptive, predictive and prescriptive analytics, and defines the role of metaheuristics in BA. A concise overview of the principles of spreadsheet modelling and optimization makes this book fairly self-contained and therefore useful for practitioners. Finally, this chapter introduces the main idea of search for a solution in a solution space, local and global optimum and the use of metaheuristics in "intelligent" search. The second chapter gives general concepts in metaheuristics search focused primarily on single-solution based metaheuristics. Through numerous hypothetical examples, the main issues in metaheuristics application are introduced: how to represent the solution; how to define the decision choices (variables), how to formulate the objective function and constraints, and how to tune the parameters. The third chapter describes the designing of heuristic procedures for solving combinatorial optimization problems that are relatively easy to formulate, but can be very difficult to solve using exact algorithms. The authors show how relatively simple constructive heuristic based on the GRASP (Greedy Randomized Adaptive Search Procedure) methodology is able to provide high-quality solutions. Since the book relies on spreadsheet modelling, more specific modelling with MS Excel, the code of GRASP constructive method is implemented using the Visual Basic macros. The fourth chapter is dedicated to Tabu Search, one of the most widely used metaheuristics, which is illustrated on the clustering problem in this book. After introducing some classic clustering methods, the authors show how clustering problem can be defined as an optimization problem. Further, again using the Visual Basic macros, the authors conduct the reader through all the elements of the Tabu Search method-

ology such as forming an initial solution and defining short and long term memory structures. Finally, in the fifth chapter, entitled "Black-Box Solvers", the authors start from the well-known dilemma: create a mathematical model that is not an accurate representation of the real system and find its optimal solution or create a mathematical model that is a good representation of the real system but for which only inferior solutions can be obtained. The distinction between general-purpose and black-box solvers is introduced and some black-box solvers such as Excel's Evolutionary Solver, LocalSolver and OptQuest are analyzed.

The book certainly deserves recommendation, primarily to the practitioners and organizations that intend to include overall business analytics features into their business processes. As the authors state: "..this book is meant to fill the gap between traditional textbooks and research papers", i.e., it fills the gap between re-searchersand practitioners.

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///////////////////////////////// **About the Author**

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Dr Dragana Makajić-Nikolić is an associate professor at the University of Belgrade, Faculty of Organizational Sciences, Serbia, where she acquired her Ph.D. (2012) degree in Operation Research. The areas of her research include: Mathematical Modelling, Optimization methods, Reliability and Risk Analysis.