
Editorial

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This special issue of *International Journal of Operational Research* concentrates on the themes of optimisation and decision-making and presents eight papers in that vein. Optimisation and decision-making are both issues that have received wide acknowledgement in the operational research community and they both have a direct connection to applications – in fact it is the needs of complex and difficult real world problems that drive the development of new optimisation and decision support techniques. In this special issue five papers with a focus in optimisation are presented from different fields of application – paper industry, public transportation, (financial) portfolio management, home healthcare, and metal industry. Decision-making is an underlying topic in all presented papers, but three papers focus on it: presented are new variants of the well known TOPSIS method for multiple-criteria decision-making and a new general tool for parametric decision analysis methods that is designed to work under conditions where setting exact parameter values is compromised, a new method for real option analysis, and an overview on simulation methods for real option valuation. Early versions of some of the papers in this special issue were presented at the 40th Anniversary Workshop of the Finnish Operational Research Society (FORS40) in Lappeenranta, Finland.

The first paper by Linnala and Hämäläinen review different multi-objective optimisation methods connected to applications in paper making. The authors hail from Finland, a country with a long history of forest industry and paper making. This overview article has a strong industry orientation and goes shortly through the main processes of paper making and discusses how optimisation methods can be applied to many relevant problems within the chain of procedures that is the paper making process. The paper emphasises the importance of problem modelling that takes place before the actual optimisation procedure; clearly an important point also with regards to other types of optimisation applications. Furthermore, attention is attached to multiple-criteria decision-making in making the final decision after gaining a set of optimal solutions from the optimisation process.

The second paper by Peña et al. discusses the world of public transit systems and especially bus rapid transit (BRT) systems and covers optimisation problems that can be found from within such systems. An overview of different optimisable components and restrictions with regards to these are presented and a number of models previously used in optimisation of mass transport are discussed. A real world situation is illustrated by

discussing the TransMilenio system of Bogotá, Columbia and going through a proposed model for optimisation of the system.

The third paper by Luukka and Collan presents a new multiple-criteria decision-making method variant, based on the classical TOPSIS. The new variant is called the Similarity-based TOPSIS and it uses a similarity measure derived from the Łukasiewicz algebra to replace the commonly used distance measure used in TOPSIS-based models. In addition to the new MCDM the paper introduces a new tool for complementing parametric decision-making methods – the new tool is called Histogram Ranking and it is independent of the underlying parametric method used. Histogram Ranking is useful in forming an overall ranking of rankings in situations, where the selection of a single parameter value is difficult or compromised by missing or imprecise information.

Home healthcare services are a growing ‘industry’ that will keep on growing for the foreseeable future as the population all over the world ages and the number of elderly people increases. In countries like Japan and some European countries population pyramids are already standing on their tip. On this background the fourth paper by Nguyen and Montemanni address the problem of routing and scheduling home healthcare staff (nurses) in a way that offers the patients the best possible solution in terms of quality of service and cost, while satisfying the demands of the patients and nurses, as well as proposed constraints. They propose two new models for the job: the Big- M method and the arc timing method. The suitability of the both methods is illustrated with computational results.

Lundell and Björk use signomial global optimisation (SGO) to solve a credibilistic portfolio adjustment optimisation problem that is based on the formulation presented earlier by Zhang and others. The method introduced is based on using transforms to change the original optimisation problem into transform space and solving it there. The paper shows how the problem can be solved with a global optimisation approach and how the global optimum for the problem is found – the found result is better than the one found in the original article and emphasises the fact that in problems of the type presented global optimisation should be considered.

Early stage investments are valued with real options in the sixth article by Lawryshyn. He introduces a new method for real option valuation that matches a market sector indicator to the underlying investment and uses Brownian motion to link managerially given cash-flow estimates to each other, to form a continuous time real option valuation model. The model is based on introducing a market sector indicator, which is assumed to be correlated with a tradable market index and drives the project’s cash-flow estimates. The model reduces into a simple analytical formula, making it easy to use. A numerical example is used to illustrate the model. This type of models are ‘in line’ with the financial asset valuation tradition and are usable under parametric uncertainty.

Real option analysis is also in the focus of the seventh paper by Haahtela – he reviews simulation-based real option methods. The paper divides the simulation-based real option methods into three categories and discusses several methods within each category; the advantages and disadvantages of each model category are discussed with regards to a number of relevant aspects. The paper is among the first to present a rather wide range of simulation-based real option analysis models.

New approaches to modelling cutting instability in steel manufacturing are presented in the eighth paper – the problem described, cutting instability, has an effect on the

productivity and efficiency of cutting procedures. The models are regression models and are based on cutting parameters, sensor data, or a combination of these – their goal is to be able to reduce the instability in the cutting process and thus end up with a more efficient process, with no reduction in safety.

The eight papers in this special issue give insights into many areas of optimisation and decision-making within a number of different fields of application. Interestingly what becomes clear is that any and all optimisation models discussed are technically also decision-support models in that optimisation results are intended to help decision-makers make good decisions.

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