
Editorial

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Anand Gurumurthy has received his Doctor of Philosophy and Master of Engineering in Manufacturing Systems Engineering from Birla Institute of Technology and Science Pilani. He has a rich experience of teaching and research and has recently been awarded the 'Outstanding Professor in Lean Six Sigma' by the Industrial Engineering and Operations Management (IEOM) Society, USA. He has published about 60 papers in peer-reviewed journals such as the *International Journal of Operations and Production Management*, *International Journal of Production Economics* and others. He is also on an editorial board of the *International Journal of Lean Six Sigma* and *Journal of Manufacturing Technology Management*.

1 Introduction

Managers, policy-makers, administrators, and others often have to take decisions in an environment characterised by uncertainty. While in a typical business operation, these uncertainties may be commonly associated with the demand and supply, it may also reflect in the realisations of costs, quality, lead times, conversion and exchange rates, disruptions, regulatory frameworks, etc. Such uncertainties pose significant challenges during decision making. The uncertainty faced by a decision-maker may originate in the random occurrences of an event in the future or the randomness associated with an outcome. The uncertainty may also arise due to the imprecision associated with a measurement. This makes decision-making under uncertainty a highly challenging and formidable task for practitioners. In numerous surveys, senior executives have emphasised managing uncertainty as one of their primary concerns.

It is, in this context, that this particular special issue was envisaged during the deliberations of the XXII Annual International Conference of Society of Operations

Management (SOM 2018). The conference was conducted at the Indian Institute of Management Kozhikode (IIMK), Kerala, India, on 20–22 December 2018. The organisers of this conference approached Professor Angappa Gunasekaran, the Editor-in-Chief, *International Journal of Operational Research*, to bring out a special issue on ‘Optimisation models in an uncertain world’. He was so encouraging and immediately approved our request. We profusely thank him for his support and cooperation.

2 Methodology

Many submissions to the special issue came from the SOM 2018 Conference. We used a two-stage process to identify and invite the papers for this special issue. In the first stage, reviewers of the conference reviewed the submission before they were selected for presentation during the SOM 2018 conference. The papers were further evaluated and scored in the second stage by the ‘session chairs’. Subsequently, the guest editors extended the invitation to submit the full manuscript only for the authors of those papers rated highly by the esteemed session chairs. The call for papers was also extended to other international researchers to make the special issue more comprehensive and diverse. All manuscripts submitted were double-blind reviewed by experts in relevant areas. After multiple revisions incorporating the suggestions and recommendations of the reviewer’s, the final acceptance was communicated to the authors.

3 About this special issue

The review process resulted in the final acceptance of 11 articles for inclusion in the special issue. We, the guest editors, are proud to present this compendium of impactful research papers covering business problems and decision-making situations in an environment of uncertainty. The articles dealt with uncertainty problems from diverse industries such as healthcare, defence, food deliveries, railways, and agriculture.

The problem of scheduling surgeries in hospitals is a complex optimisation problem and often need to fulfil multiple objectives. Solution approaches require researchers to put effort into developing efficient algorithms. Britt et al. considered several competing objectives, stakeholders, and resources while trying to schedule surgeries when the surgical durations and the patient length of stay are uncertain. They used stochastic goal programming and metaheuristics to solve the problem. They also carried out computational experiments to evaluate the solution method and assess the relationships between the goals. On the other hand, Chouksey et al. focused on healthcare availability and accessibility in developing countries. They considered neonatal services and evaluated the economics of establishing and running such services. They have used a mixed integer linear programming (MILP) model for determining the number and the locations of service facilities.

Three works in this special issue dealt with transportation and logistics problems. The challenging nature of the transportation and logistics industry problems has always attracted OR researchers to develop efficient and effective solutions. Sarhadi et al. considered the possibility of disruptions in the railway network and the strategy of using intermodal terminals to mitigate such disruptions’ risks. They proposed a combination of

tabu search metaheuristic and decomposition-based techniques to minimise the effects of work-case disruptions on a given number of intermodal rail terminals. Sivanandham and Gajanand considered the idea of using autonomous truck platoons for minimising costs and emissions. They presented a departure time coordination-based heuristic for platoon formations and compared the performance of their heuristic with some of the existing algorithms for solving the problem. Abdolhosseinzadeh focuses on the traditional shortest path problem set in online networks where some parameter values, such as the exact traversed length, the average shortest path length, and the shortest path length, are unknown a priori. They proposed three different stochastic models to determine decision criteria, such as the competitive ratio. They claim to have produced a better competitive ratio than previous works.

Another primary emphasis of this special issue is on the production environments that are characterised by several uncertainties. Although being extensively addressed in the literature, production planning and scheduling is one of the major themes of researchers focusing on a variety of problem contexts and developing solution approaches that are computationally more efficient and implementable. Saddikuti et al. considered the line balancing problem for a robotic assembly line and formulated a multi-objective optimisation problem for minimising cycle time and cost. The problem is NP-hard. Therefore, they used the feature of a non-dominated sorting genetic algorithm (NSGA-II) along with simulated annealing (SA) local search algorithm to propose a hybrid multi-objective evolutionary (H-MOE) algorithm and claims to obtain better performance compared to other existing algorithms. Belay et al. applied multi-objective probabilistic fractional programming problems for planning production, where many parameters are continuous random variables. They used a stochastic simulation-based genetic algorithm to find a set of Pareto optimal solutions. Rajput et al. focused on the production planning problem in a fuzzy environment where the goals and inventory parameters are not precise. They also proposed a novel defuzzification methodology for the economic production-quality model and determined the optimal criteria for the problem.

Another group of research articles focused on socially-responsible operations management. Dalal developed a novel donor-beneficiary strategic assignment model that connects volunteers with a set of habitats having under-nourished children. He proposed a two-stage stochastic programming model for demand and supply uncertainties scenarios that determine optimal strategic connections at minimum cost. Patel carried out a game-theoretic analysis of contractual arrangements under market uncertainty in an agriculture supply chain. He evaluated Bayesian Nash equilibrium and mixed strategy Bayesian Nash equilibrium for an informal contract with incomplete information.

Naouara and Trabelsi proposed a new infinite-horizon discounted non-linear optimal multiple stopping times problem and decomposed it into a sequence of ordinary optimal stopping problems. They have also considered the particular case of a diffusion process and determined explicit expressions for the value function and also the optimal stopping strategy. The model was then used on a new generalised swing contract and proved that the call forward swing option price is near to the classical swing option for the same quantity of oil.

4 Conclusions

As one can observe, the special issue has collated many exciting optimisation problems facing uncertainties of different kinds in diverse contexts such as healthcare, production planning, social service, agriculture, transportation and logistics, and finance. Various optimisation methodologies such as MILP, stochastic dynamic programming, game theory, fuzzy optimisation, multi-objective goal programming, fractional programming, stochastic programming, and algorithms and metaheuristics were utilised to model these problems. We hope the readers would immensely benefit from this special issue. They might gain meaningful insights, newer ideas, and novel methods to solve the uncertainty problems that they may face in the future.

We also take this opportunity to extend our sincere thanks to Professor Angappa Gunasekaran for the chance to guest edit this special issue. We also extend our thanks to the Inderscience Publishers and the editorial team of *IJOR* – Mr. Albert Ang and Ms. Norma Banks for their support and cooperation.