

---

## Editorial

---

### Mikael Collan\*, Pasi Luukka and Kalevi Kyläheiko

School of Business,  
Lappeenranta University of Technology,  
Skinnarilankatu 34, 53850 Lappeenranta, Finland  
Email: mikael.collan@lut.fi  
Email: pasi.luukka@lut.fi  
Email: kalevi.kylaheiko@lut.fi  
\*Corresponding author

---

Coping with uncertainty has been a central topic amongst economists, decision theoreticians, and strategy researchers during the last century. Ever since Knight's (1921) seminal contribution, the distinction between *certainty*, *risk* and *uncertainty* has served as a basis of categorising 'certainty-uncertainty' – continuum. Clearly, investments and other economic actions would be no problem under certain circumstances where a (cognitively competent) decision maker would have certain knowledge and a perfect foresight about all the relevant future states (or events) of the world and her/his actions do not affect these events. Then an agent could respond with complete flexibility to every change in her/his environment. However, and importantly, in the fully certain world there would be no opportunities to profit from innovation, since arbitrage processes would be extremely efficient and the window of opportunities would be closing very rapidly. Hence, only uncertainty creates profit opportunities that can be explored, structured and exploited. From this observation arises a need for efficient methods to overcome the obstacles created by uncertainty to profit from the opportunities created also by uncertainty. In a way one can regard uncertainty and its many facets as a main catalyst for developing new approaches in decision sciences. This special edition organised by the Finnish Operations Research Society for celebration its 40th anniversary tackles the issue of uncertainty from many angles with eight original contributions.

Vehicle routing problems are a well-known category of logistics related optimisation problems, one of the better known methods for solving them is ant colony optimisation. In the first paper of this special issue, Toklu, Papapanagiotou, Klumpp, Gambardella and Montemanni present a model for considering a variant of the vehicle routing problem with uncertain stochastic demands (VRPSD) where the demand can increase and with two stages; such situations are realistic and may depend on, for example, the bullwhip effect evident in many logistic chains. The paper tests different approaches to solve the problem and shows experimental results for the solutions with shortest overall distances and for the least number of needed vehicles.

Coping with uncertainty by means of real options models is in the focus of the second paper by Collan, Haahtela and Kyläheiko – they discuss the usability of these models under different types of uncertainty. Real option analysis is meant to work as a tool to consider the value of managerial flexibility in investment decision-making under uncertainty. There are many different model types with different types of information

requirements and all models do not fit all the situations. This is a topic that has largely been ignored in the literature on real option valuation. The authors first present different types of uncertainty (parametric, structural, and procedural) and then discuss different model types and their information requirements – they conclude with observations about the usability of the different model types under the different types of uncertainty following the famous dictum of Lord Keynes “It is better to be roughly right than precisely wrong”.

Imanirad, Yang and Yeomans discuss environmental policy decision-making under uncertainty; environmental decision-making is complex, as there are typically competing and incompatible issues involved and it may be impossible to find a single optimum that can be accepted by a majority of decision-makers. For this reason the authors observe that if decision-makers are offered multiple, maximally different from each other, optimised to a high degree decision alternatives, rather than only one optimal solution, they are most likely to be better off in finding a consensus on one of the multiple solutions. To achieve this goal the authors utilise a modelling to generate alternatives (MGA) approach and present a biologically-inspired metaheuristic simulation optimisation MGA method suitable for the job. The new method is illustrated with a rather detailed case study around the decision-making on the expansion of a waste management facility. It becomes evident that the presented new method and MGA in general are very flexible in terms of fields of usability and offer much in the way of supporting decision-making under conflicting interests and uncertainty.

The fourth paper discusses the difficult issue of evaluating works of art, an issue that can be said to be more of an art than a science. The approach that the authors Stoklasa, Talášek and Talašová take is that of utilising the well-known analytic hierarchy process (AHP) framework of Thomas L. Saaty as a basis of a new model that relaxes the preference consistency requirement of the original model to a less restricting ‘weak consistency’. The authors observe that (even) the use of linguistic terms in the pair-wise evaluation by experts may lead to difficulties with AHP matrix consistency, especially when experts do not have a mathematical background (as often is the case in the evaluation of works of art) and show how weak consistency can be used to solve these problems. The benefit of using weak consistency is discussed and practical direction is given with regards to ensuring weak-consistency by organising the pair-wise comparison situation in a correct way. The method is illustrated with a practical application into the evaluation of works of art in the Czech Republic. The authors posit that methods, such as the one presented may be useful in, for example, screening and selecting art works and projects as recipients for funding.

The paper by Pätäri, Karell and Luukka introduces a new and innovative method for value investor portfolio selection by adjusting the conventionally used valuation ratios on the basis of firm size, financial leverage, and industry classification. The adjustment is done with a selection criterion that is a combination of the aforementioned three factors. Analysis of the new method shows that the suggested multi-dimensional combination criteria can add value to equity portfolio selection. The performance of top-tercile portfolios created with the new method outperform both the comparable bottom portfolios and the stock market portfolio, the results are statistically significant by all performance metrics employed. The new method, introduced in the paper offers an interesting alternative for identifying undervalued stocks by capturing several dimensions of relative value and peer-group comparisons simultaneously.

The use of different real option analysis approaches in evaluation of a medical device R&D project investments is under review in the paper by Barton and Lawryshyn. The authors present a literature review on the use of real option analysis in the medical industry. A medical device benchmark project is used to compare five selected real option analysis approaches to calculate the value of the project as a compound real option. It becomes evident that the comparison of the five different approaches is not very straightforward as each method has a singular construct and the input values used play a large role in the analysis outcome. Using the findings of the authors together with what has been said about the usability of different real option analysis approaches in the paper by Collan, Haahtela and Kyläheiko yields a lot of information in the way to understanding which real option models to adopt and how the models work in practice.

Investment profitability analysis is commonly split into separate processes that depend on in which stage of the investment lifecycle an investment is at. A planning phase that includes an investment life-time profitability analysis commonly precedes the investment decision, and it is followed by an operational management phase. During the operational management of investments, holistic profitability analysis of the investment is left on the shoulders of the operational management and is often considered of secondary importance, as managers optimise on short-term: this is often a by-product of the so called quarter economy. Overall investment profitability is only investigated afterwards (if ever) by post-audits, which again are separate processes. Sandström, Kyläheiko and Collan discuss the potential problems caused by the discontinuities in profitability analysis of investments and propose unifying the three separate processes into a single dynamic profitability management of investments process. The authors propose the use of information systems for the task and discuss how fuzzy numbers may be integrated into and used in such systems to represent investment cash-flow estimates that are able to store both quantitative and qualitative information. The changes in information during the investment life and how they are reflected with fuzzy cash-flow estimates is also discussed. The authors believe that if 'real time' information about the overall profitability of investments is available during the operational management phase, it will have an impact on the management decision-making.

In the final paper of this issue, Georgescu and Kinnunen discuss risk aversion and prudence – both issues that are relevant to investment decision-making and to risk theory; these topics have been previously extensively studied in the probabilistic framework. The authors present a new approaches to these issues and within the possibilistic (fuzzy) framework they establish relationships between credibilistic risk aversion and prudence. They present a credibilistic model of optimal saving and its connection with prudence. Credibility theory hails from the world of actuarial science and has been used widely in the insurance rate making. Inclusion of credibility theory into the discussion about risk aversion and prudence introduces the element of discussing how well, for example, an obtained distribution is believed to represent a phenomenon and thus, how credible information with regards to a given purpose is. It is important to note that credibility of information changes, when the purpose to which it is used changes – credibility is context dependent.

### **Acknowledgements**

The guest editors are grateful to Professor Gunasekaran, the Editor-In-Chief of the *International Journal of Business Innovation and Research* and to the reviewers who reviewed the manuscripts submitted to this special issue. We would also like to express our thanks to all the authors.