# Introduction to Minitrack: Multi-criteria Decision Analysis and Support Systems

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## Abstract

*Almost all decisions people make are based on multiple factors or criteria. Decision makers generally pursue multiple, and often conflicting, objectives. A feasible solution that is optimum with respect to all such objectives or decision criteria almost never exists, and a satisfactorily compromised solution is generally sought. Multi-criteria decision analysis as a field of research deals with problems, theory and solution approaches directly involving multiple decision criteria. This minitrack focuses on solution approaches, technology, and systems that support decision-making under consideration of multiple decision criteria.*

## 1. Introduction

Multiple criteria decision problems generally do not possess a mathematically well-defined optimum solution. Thus, the best a decision maker (DM) can aspire is to find a satisfactorily compromised solution amongst the efficient (non-dominated) solutions. Usually there is no known and explicit utility function representing the preferences of the DM, and interactive solution techniques are often proposed to identify the preferred solution or perhaps a manageable set of desirable compromised solutions.

Multi-criteria decision analysis (MCDA), an active area of research since the 1970s, deals with structuring and solving decision problems with explicit consideration of multiple decision criteria. Thousands of articles and dozens of books have been devoted to this field, with several regular conferences and conference tracks focusing on this area.

This minitrack on MCDA is in its ninth year as part of the HICSS program. It has attracted an average of ten paper submissions each year, with an average acceptance of five submitted papers. In addition, at HICSS-45, Jyrki Wallenius from Aalto University in Helsinki, Finland, gave a keynote address on *Multi-objective Optimization – Different Interaction Styles and an Approach* as part of this minitrack, and at HICSS-47, Raimo Hämäläinen, also from Aalto University, moderated a panel on *The Process of Multicriteria Decision Support – Practical Approaches, New Perspectives, and Behavioral Issues* in this minitrack.

## 2. Papers in this minitrack

This year, four papers have been accepted for this minitrack that cover four important topics in multi-criteria decision analysis: (i) gamification strategies for improving student learning outcomes, (ii) regression discontinuity in time models for analyzing mergers and acquisitions, (iii) fuzzy analytics and information retrieval-based approaches for selecting PhD supervisors and finally (iv) comparative analysis of six interactive preference measurement methods for problem domains where the decision problem context changes.

In the paper "*Gamification of the future: an experiment on gamifying education of forecasting,*" the authors present a gamification tool for enhancing and quantifying the learning outcomes of classroom students. A learning platform considering three gamification strategies was developed and evaluated on a cohort of 261 students in an undergraduate and MBA course over a period of one and half years. The authors further designed a web-based toolkit named F-LauReL for this purpose. The results show that such gamified applications can serve as a complementary teaching tool for forecasting in courses and had a positive impact on students' learning performance.

In the paper "*Using prior probability outcomes for the evaluation of mergers and acquisitions,*" the authors designed a regression discontinuity in time model (RDiT) to examine the effect of a KPMG research report on the value and frequency of mergers and acquisitions (M&As). In their analysis of high failure rates of M&As, the authors presented some mixed results, where M&As values showed some minor negative discontinuity since 1999, while

they exhibited a slight growth after 1999. Overall, this is an interesting paper that illustrates the use of RDiT in the domain of multi-criteria decision analytics.

In the paper "*A Multi-criteria Decision Support System for Ph.D. Supervisor Selection: A Hybrid Approach*", the authors postulated a two-stage multi-criteria decision support system for optimal PhD supervisor selection. They employed a fuzzy analytic and information retrieval-based similarity algorithm to model the PhD supervisor selection while utilizing domain specific knowledge. The proposed model was evaluated on 20 students in the host department and detailed evaluation results were presented. The proposed system does not require the professor's involvement and no subjective measures were employed which contributes to the novelty of the system in comparison to other similar works.

Many proposed interactive multi-criteria decision making approaches allow for the decision makers preferences to evolve, but assume the decision problem context to remain unchanged. The paper "*Assessment of Multi-Criteria Preference Measurement Methods for a Dynamic Environment*" addresses the multi-criteria decision problem where the decision is made over a period of time during which the decision criteria and alternatives may change during the course of the decision-making process. This is an interesting problem and should inspire interesting discussion at the conference. The paper investigates six interactive preference measurement methods as to their suitability to dynamically adjusting preferences as the decision problem context changes. Though none of the evaluated methods was found to be suitable for a dynamic decision environment, some of the methods provide mechanisms that allow extensions to fit the dynamic decision context demands. Specifically, the results suggest that the adaptive self-explication method of Netzer and Srinivasan is the most promising approach for extension to dynamic decision-making.