

We introduce a class of generalized convex functions and we analyze its relationships with the generalized convex properties commonly studied in the literature. In particular, the proposed class is compared with the ones of invex and generalized invex functions. The new property is used to derive necessary and sufficient optimality conditions and to obtain duality results for vector optimization problems.

### 3 - Bernstein-Doetsch type results for h-convex functions

*Attila Háyzy*, Department of Applied Mathematics, University of Miskolc, Miskolci Egyetem, 3515, Miskolc-Egyetemváros, Hungary, matha@uni-miskolc.hu

In our talks we introduce the more general concept of the h-convexity, and the concept of the so called (H,h)-convexity. This type of h-convexity is a common generalization of the usual convexity, the Godunova-Levin functions, the Breckner s-convex functions and the so called P-functions.

The main goal of the talk is to prove some regularity and Bernstein-Doetsch type result for h-convex and (H,h)-convex functions. We also collect some facts on such functions and collect some interesting, easily-proved properties of h-convex functions.

### 4 - Regularity and convexity results on approximately h-convex functions

*Pál Burai*, Applied Mathematics and Probability Theory, University of Debrecen, Faculty of Informatics, Pf.: 12., 4010, Debrecen, Hungary, burai.pal@inf.unideb.hu, *Attila Háyzy*

In 1915 Bernstein and Doetsch proved the following: if a Jensen-convex function is bounded from above at a point of its domain, then it is continuous on the whole domain and convex. The main goal of this talk to prove a Bernstein-Doetsch type result on approximately h-convex functions.

## TC-35

Tuesday, 12:20-13:40

6.2.46

### Researching Facilitated Modelling

Stream: Facilitated Modelling in OR

Invited session

Chair: *Etiënne Rouwette*, Thomas van Aquinostraat 1.2.33, PO Box 9108, 6500 HK, Nijmegen, E.Rouwette@fm.ru.nl

#### 1 - Shifting Perspectives from the Individual- to the Team-Level: The Role of Mental Model Convergence

*Sara McComb*, Texas A&M University, United States, mccomb@tamu.edu

How do individuals become team members? Why do teams that appear to be similar have very different outcomes? Understanding mental model convergence may provide insight into these types of questions. Individual team members create cognitive frameworks that facilitate team collaboration and converge across members over time. This paper describes the convergence process, as it may explain how team members shift their perspectives from the individual- to the team-level, and presents empirical results demonstrating the relationship between the convergence process and effective performance.

#### 2 - Exploring the role of Cognitive Style on the Structuring and Definition of Ill-structured Management Problems.

*L. Alberto Franco*, Warwick Business School, University of Warwick, ORIS Group, Gibbet Hill Road, CV4 7AL, Coventry, United Kingdom, alberto.franco@warwick.ac.uk, *Luiz Felipe Nasser-Carvalho*

We report preliminary findings from a quasi-experimental field study on the role of managers' Need for Cognition and Need for Closure on characteristics of their: a) causal problem representations, b) problem definitions and, c) attitudes towards structuring ill-structured problems.

The findings suggest that while Need for Cognition influences positively managers' confidence in, and enjoyment of their structuring efforts, Need for Closure hinders managers' understanding of ill-structured problems. Implications for research and practice of Problem Structuring Methods are discussed.

#### 3 - Strategy Maps as a Tool to Support Strategic Management — How to Optimally Map Your Strategy

*Melanie Windolph*, Chair of Management Accounting and Control, University of Goettingen, Platz der Goettinger Sieben 3,

37073, Goettingen, Germany, melanie.windolph@wiwi.uni-goettingen.de, *Judith Huelle*, *York Hagmayer*, *Klaus Moeller*

The study's purpose is to analyze main problems when creating strategy maps for supporting strategy's implementation. To examine key problems in the creation process, we conducted two experiments with students from the university of Goettingen and managers from the automotive industry. The results indicate that while participants did choose strategic goals covering global and specific aspects of the firm's strategy, they repeatedly failed in defining the main relations between the goals. Furthermore, participants' self-assessment was significantly better than the maps' objective evaluation.

#### 4 - Decision Development in Facilitated Modelling Workshops

*Etiënne Rouwette*, Nijmegen School of Management, Radboud University Nijmegen, 6500 HK, Nijmegen, Netherlands, e.rouwette@fm.ru.nl, *L. Alberto Franco*

Facilitated modelling has its most direct impact on the way a convened group of participants produce their decisions. By facilitating the decision development process, and capturing the content of group discussions in the form of models, we attempt to provide effective group decision making support. Despite its central role in assisting the group decision development process, limited attention has been paid to this dimension in the literature of facilitated modelling. Indeed, although a large number of published cases studies of facilitated modelling interventions are available, the majority of these studies do not provide any detail below the level of the modelling workshop; that is, modelling procedures and general outputs and outcomes may be described but there is no portrayal of the decision development process within the workshop. To address this gap, we map the different conceptualisations of decision development that seem embedded within the facilitated modelling tradition, and contrast them with well-established theoretical models from the group communication field. Our analysis identifies a number of research possibilities for the study of facilitated modelling workshops from a decision development perspective, and suggests a research strategy that can help to further develop facilitated modelling theory and practice. Central to this strategy are interaction coding and analysis methods for the examination of facilitated modelling workshops. By adopting such a research strategy we show how a decision development focus can increase our understanding of the rich and complex nature of facilitated modelling 'as it happens'.

## TC-36

Tuesday, 12:20-13:40

3.1.05

### Fuzzy Decision Making and Applications

Stream: Fuzzy Systems, Neural Networks & Artificial Intelligence [c]

Contributed session

Chair: *Burcu Caglar*, Industrial Engineering, Uludag University, Uludag University Dept. of, Industrial Engineering Gorukle Campus, 16059, Bursa, Turkey, burcucaglar@gmail.com

#### 1 - Fuzzy Reactive Project Scheduling

*Dorota Kuchta*, Informatics and Management, Wrocław University of Technology, ul. Smoluchowskiego 25, 50-372, Wrocław, Poland, dorota.kuchta@pwr.wroc.pl

In the literature no methods of project schedule control and modification (i.e. for reactive project scheduling) are known for the case of fuzzy activities duration times. We will propose a method of performing project control at regular time intervals and of updating the project schedule using updated information about the actual crisp duration of finished activities and about the (less and less) fuzzy duration of unfinished activities, as well as about the (also less and less) fuzzy number of available resources.

#### 2 - Determining Strategic Priorities With Fuzzy TOPSIS Method

*Ihsan Yüksel*, Business Administration, Kirikkale University, Kirikkale University, IIBF, 71450, Kirikkale, Turkey, yuksel@kku.edu.tr, *Metin Dagdeviren*, *Erdem Aksakal*

Companies, under the series affect of inhibitive and incentive factors, try to achieve their goals with limited financial (stock, equity capital, business capital) and non-financial (human resources, knowledge, competence) resources. This can be possible after determining the strategic priorities of the company. The aim of this study is to determine the company strategies with fuzzy TOPSIS technique which depends on the strengths and weaknesses caused by internal environment, opportunities and threats caused by external environment.

### 3 - Multifactor Bullwhip Effect Analysis Using Fuzzy Model

*Ronay Ak*, Industrial Engineering, Istanbul Technical University, Istanbul Teknik Universitesi, Isletme Fakultesi, Endüstri Muhendisligi Bolumu, 34367, Istanbul, Turkey, ronay\_ak@yahoo.com, *Gulgun Kayakutlu*, *Cafer Ethan Bozdog*

Bullwhip Effect (BWE) studies are focused on either the causes or the solutions of demand fluctuations. This study aims to measure the effects of demand and lead time fluctuations on a typical Supply Chain (SC) of three echelons representing supplier, manufacturer and retailer. In such a Supply Chain, demand is analyzed upstream despite the lead time flows downstream. Contribution of this study is the analysis of integrated fuzzy demand-lead time model. The proposed model will give an opportunity for better Supply Chain plans.

### 4 - Statistical Procedures for Robotic Assembly Line Balancing Problems

*Burcu Caglar*, Industrial Engineering, Uludag University, Uludag University Dept. of, Industrial Engineering Gorukle Campus, 16059, Bursa, Turkey, burcucaglar@gmail.com, *H. Cenk Özmutlu*, *Ali Yurdun Orbak*, *Seda Ozmutlu*

Robotic systems have been an essential part of assembly lines, because of their advantages such as flexibility and automation. This study presents an application of type II robotic assembly line balancing (rALB-II) problem, in which the assembly tasks have to be assigned to robots. In order to maintain a balanced workload while achieving a desired production cycle time, a fuzzy clustering based algorithm is employed for the job assignment problem. The proposed algorithm is applied to a real robotic assembly line system and its advantages over the existing system is explained.

## TC-37

Tuesday, 12:20-13:40

3.1.09

### Models for Decision Making & Decision Analysis

Stream: Decision Support Systems

*Invited session*

Chair: *Fatima Dargam*, SimTech Simulation Technology, Ries Strasse 120, 8010, Graz, Austria, F.Dargam@SimTechnology.com

Chair: *Pascale Zaraté*, Institut de Recherche en Informatique de Toulouse, Toulouse University, 118 route de Narbonne, 31062, Toulouse, France, zarate@irit.fr

#### 1 - Influence of the criteria in the bayesian ahp

*Pilar Gargallo*, Facultad de Económicas, Universidad de Zaragoza, Gran Vía 2, 50005, Zaragoza, Spain, pigarga@unizar.es, *José María Moreno-jimenez*, *Alfredo Altuzarra*

This work proposes different methodologies for measuring the influence of a set of criteria on the final priorities of the Analytic Hierarchy Process (AHP) in a global context (a hierarchy). The priorities have been obtained by means of the Bayesian prioritization procedure of Altuzarra et al. (2007). Cross-validation methods have been used when measuring the influence. The methodology is illustrated by means of an empirical example.

#### 2 - Structuring and assessing large and complex decision problems using MCDA

*Michael Bruhn Barfod*, Department of Transport, Technical University of Denmark, Bygningstorvet, Building 115, DK-2800, Kgs. Lyngby, Denmark, mbb@transport.dtu.dk, *Steen Leleur*

This paper presents an approach for the structuring and assessing of large and complex decision problems using multi-criteria decision analysis (MCDA). The MCDA problem is structured in a decision tree and assessed using the REMBRANDT technique featuring a procedure for limiting the number of pair wise comparisons. A case study dealing with the structuring and prioritisation of projects from a large pool with limited funds is used for illustrating the approach. Finally, strengths and weaknesses in the MCDA approach are discussed and conclusions are made.

### 3 - Transitioning the Multistatic Tactical Planning Aid (MSTPA) towards Decision Support

*Christopher Strode*, Systems and Technology, NATO Undersea Research Centre, Viale S. Bartolomeo 400, 19126, La Spezia, Italy, strode@nurc.nato.int

The MSTPA tool is a multistatic sensor model able to determine the probability of detection, track holding, and classification of a target. This report surveys the approaches to be taken in order to transition the model towards decision support, that is, one that not only determines a performance measure for a proposed network geometry, but one that must determine an optimum geometry for a given scenario. This transition will require the addition of data mining, optimization and game theory modules to assist the operator in making the most informed decision.

## TC-38

Tuesday, 12:20-13:40

6.2.44

### Stochastic Valuation of Derivatives and Commodities II

Stream: Stochastic Valuation for Financial Markets

*Invited session*

Chair: *Gerhard-Wilhelm Weber*, Institute of Applied Mathematics, Middle East Technical University, ODTÜ, 06531, Ankara, Turkey, gweber@metu.edu.tr

Chair: *Henrik Andersson*, Accounting, Stockholm School of Economics, P.O. Box 6501, 113 83, Stockholm, Sweden, Henrik.Andersson@hhs.se

#### 1 - Pricing and Positioning of Remanufactured Products Using a Nested Logit Model

*Necati Aras*, Industrial Engineering, Bogazici University, Bebek, 34342, Istanbul, Turkey, arasn@boun.edu.tr, *Esra Mutlu*, *I. Kuban Altinel*

We focus on the selection of remanufactured products to be offered by a firm in addition to the existing brand-new versions. We develop a mixed-integer nonlinear programming formulation using nested logit model to determine the product's best prices so that the firm's profit is maximized. The model is solved by decomposing it into two sub-problems. The pricing sub-problem is solved by a modified simplex search procedure whereas the product selection problem is solved via complete enumeration. Using an extended model, we also find the optimal quality level of the remanufactured products.

#### 2 - Comparative Evaluation of the Unique Elements in the Evolution of e- and m- Auctions

*Charis Marentakis*, Dept. of Industrial Management and Technology, University of Pireaus, Karaoli and Dimitriou Street, 18534, Pireaus, Greece, chmarent@unipi.gr, *Dimitrios Emiris*

The evolution of auctions conducted over the Internet and mobile networks (e and m auctions, resp.) created an interdisciplinary research area, combining Economics, OR, Information Technology and Communications (ICT). We bridge the gap between design mechanisms and ICT infrastructure. It employs an evolutionary, 3-level auction classification model to progressively determine the mechanism and adapts it to an e and/or m context. The unique design elements for each auction class are compared. Findings are tested and evaluated in a pragmatic freight transport services setting.

#### 3 - When operating cash flows are mean-reverting

*Henrik Andersson*, Accounting, Stockholm School of Economics, P.O. Box 6501, 113 83, Stockholm, Sweden, Henrik.Andersson@hhs.se

This paper deals with investment analysis of mean-reverting cash flows and changing levels of utilization in the forest industry. Generally, mean-reversion enhances the value of a basic project and reduces the value of managerial flexibility due to less uncertainty. However, the outcome is crucially dependent upon whether the equilibrium price is above or below today's price. A generalized version of the Feynman-Kac formula is applied but as option modeling is no success in the business community, a rough cut approximation is suggested as a comparison to standard DCF-valuation.