Theory and Applications of AHP/ANP at MCDM 2022

Birsen Karpak
Youngstown State University

Participants of the 26th International Conference on Multiple Criteria Decision Making (MCDM2022) at the University of Portsmouth, UK June 26 - July 1, 2022

We had a wonderful welcome from the conference organizers Alessio Ishizaka (Chair), Banu Lokman (Co-chair), Dylan Jones (Program Chair), Ashraf Labib, Salvatore Greco, Negar Akbari, Maria Barbati and Salem Chakhar of the 26th International Conference on Multiple Criteria Decision Making (MCDM2022) which was held at the University of Portsmouth, UK from June 26 - July 1, 2022. The purpose of the MCDM conference is to bring together the MCDM community every two years. This year however, there had been a gap of three years since our last meeting because of Covid. Conference organizers did not want us to miss the opportunity to experience face-to-face interaction with students and colleagues in Portsmouth, UK, so they rescheduled MCDM 2021 to 2022. I am sure most of the participants benefited from the discussions after the talks, and

enjoyed the social program that brings our community closer together and inspires future collaboration.

MCDM 2022 brought together academics, researchers, practitioners, and other professionals from around the world. It was a great opportunity for the delegates to present, discuss, network, and hear about the recent advances in MCDM. The distinguished plenary speakers included Professor Salvatore Greco from the University of Catania, Professor Murat Köksalan from the University of Michigan, and Professor Luis Martínez from the University of Jaén.

The Scientific Program Committee consisted of Matthias Ehrgott, Lancaster University, UK; Carlos Coello Coello, CINVESTAV-IPN, Mexico; Kerstin Daechert, Fraunhofer Institute ITWM, Germany; Michalis Doumpos, Technical University of Crete, Greece, José Rui Figueira, Technical University of Lisbon, Portugal; Salvatore Greco, University of Catania, Italy; Birsen Karpak, Youngstown State University, USA; Kathrin Klamroth, Bergische Universität Wuppertal, Germany; Murat Köksalan, Michigan University, USA; Banu Lokman, University of Portsmouth, UK; Alessio Ishizaka, University of Portsmouth, UK; Dylan Jones, University of Portsmouth, UK; Caroline Mota, University of Pernambuco, Brazil; Francisco Ruiz, University of Malaga, Spain; Hsu-Shih Shih, Tamkang University, Taiwan; Johannes Siebert, Management Center Innsbruck, Austria; Theo Stewart, University of Cape Town, South Africa; İlker Topçu, İstanbul Technical University, Turkey; and last, but not least, Jyrki Wallenius, Aalto University, Finland. The Scientific Program Committee contributed to the success of the conference in a variety of ways including chairing award committees, reviewing papers, and being instrumental in getting many invited participants to the conference.

The conference consisted of the following eleven streams: Analytic Hierarchy/Network Processes chaired by Enrique Mu and Rozann Saaty; Evolutionary Multiobjective Optimization by Carlos Fonseca; Multiobjective Optimization by Serpil Sayin; Goal Programming by Fouad Ben Abdelaziz; Outranking Methods by José Figueira, Salvatore Corrente and Yves De Smet; Rule-based Methods and Artificial Intelligence by Salvatore Greco; Value and Utility Models by Milosz Kadzinski; Data Envelopment Analysis by Ali Emrouznejad; Best-Worst Method by Jafar Rezaei; Interactive MCDM by Jyrki Wallenius and Applications of MCDA by Sarah Ben Amor and Sachin Mangla.
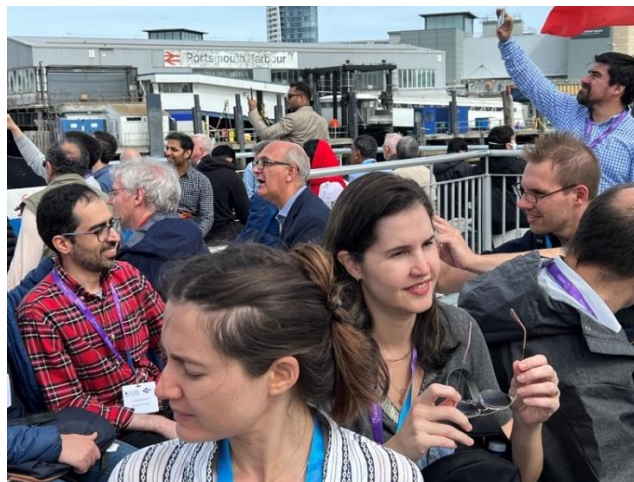
Theory and applications of the Analytic Hierarchy and Network Processes (AHP/ANP) and extensions were presented in the AHP/ANP streams as well as in the Applications of MCDA stream. I will provide a summary of some of them that I was able to attend. Interested readers can find all of the presentations in the program and book of abstracts.

Antonella Petrillo and I invited quite a few participants from the AHP/ANP community to a special session titled "AHP/ANP and Extensions: Applications in Supply Chain Management and Industrial Engineering." Though it was difficult to get a timely visa for the UK, and quite a few of our invited AHP/ANP delegates had to cancel their trip at the last minute (some of them received their UK entrance visas a month after the conference!), we still had AHP/ANP and extensions' presentations every day of the conference.

In the following paragraph, I will provide a summary of the sessions I was able to attend. Samah Alnuaimi from Sheffield Hallam University, UK, (coauthor Sameh Saad from the same university) presented "**An Innovation Framework for the Digital Era an AHP Comparison Approach between the UK and Germany.**" Cecilia Montt from Universidad de Santiago de Chile, (coauthors Luz Martinez, Luis Quezada and Astrid Oddershede from the same university) presented **Method for Characterizing Risk Management Using Multi-criteria.** The most influential factors in determining the risk are identified using the Analytic Hierarchy Process (AHP). It was great to see my friend Astrid Oddershede from Universidad de Santiago de Chile, who I had met at Thomas and Rozann Saaty's home many years ago. Miguel Angel Ortiz-Barrios from Universidad de la Costa CUC, Colombia (coauthors Armando Pérez-Aguilar and Pablo Pancardo both from Juarez Autonomous University of Tabasco, Colombia) presented "**Multi-criteria Hybrid Approach for Prioritizing Suspected Covid-19 Patients Within the Public Emergency Departments: A Case Study.**" Valerio Salomon from Sao Paulo State University, Brazil, (coauthor Antonio Lombardi Netto from the same university) presented "**Including Environment, Social and Governance (ESG) Into the Multi-criteria Analysis of Investments.**" Valerio Salomon explained how they combined fuzzy ANP with a Monte Carlo simulation in credit risk analysis and asset selection. Luis Vargas from University of Pittsburgh, USA, (coauthors Marcel Minutolo from Robert Morris University, USA and Amos Guiora from University of Utah, USA) presented "**How to Measure the Impact of Gun Laws on Lawful Owners of Guns**." Birsen Karpak from Youngstown State University, USA presented "**A Framework for Prioritizing Sustainable Third-Party Logistics Service Providers: A Case Study,**" (coauthors Ozden Bayazit from Central Washington University, USA and Tacibaht Turel from Youngstown State University) and "**AHP/ANP Applications of Big Data Analytics in Supply Chain Management**" (coauthors Ilker Topcu from Istanbul Technical University, Turkey and Fusun Ulengin from Sabanci University, Turkey) since both Ozden Bayazit as well as Fusun Ulengin could not make the conference though both had registered and were planning to come. "**AHP/ANP Applications of Big Data Analytics in Supply Chain Management**" was an update about the study that the authors presented at INFORMS 2021. In this new study, the authors first searched the Web of Science (WoS) Core Collection database considering terms related to big data analytics (BDA) and supply chain management (SCM) and found 563 articles published before the end of 2021. Then, they explored AHP/ANP and extensions applications in big data enabled supply chains as of May 2022. After comparing and summarizing the reviewed approaches, they identified the primary research opportunities where the deployment and use of 'big data' is likely to have a significant impact on supply chain management. They came up with some future challenges of BDA in SCM for collecting data, storing data, cleaning and verifying data, summarizing data, and modeling with big data. Big data enabled digital supply chains and big data adoption risks involved in sustainable supply chains are among the new research directions they are considering. Ram Kumar Dhurkari from Indian Institute of Management Sirmaur, India presented "**Improving the Predictive Power of AHP-based Decision Support Systems.**" Yuji Sato from Graduate School of Management, Japan presented "**An Improvement of the Consistency Index in Pairwise Comparison.**" He proposes a new inconsistency index

based on the mathematical property of a pairwise comparison matrix and further validated based on the conformity and the goodness-of-fit of weight. He asserts that the proposed index detects inconsistency among real-world pairwise comparisons (PCs) more sensitively than the Consistency Ratio. Vanessa Assumma from Polytechnic University of Turin, Italy (coauthors Marta Bottero from the same university and Alessio Ishizaka from NEOMA Business School, France) presented "**GANP-Fuzzy Sorting II Method for the Environmental Planning and Management of the Susa Valley**." This study aims to support both decision makers and policy makers in the definition and prioritization of complex and uncertain strategies and recommendations. Particularly, this work focuses on MCDA sorting classification to deal with complex spatial systems with interdependences, such as biocultural landscapes. The contribution starts from an existing sorting method called Group Analytic Network Process Sorting II method (GANPSort II), which was developed in the context of Vanessa Assumma's Ph.D. thesis and based on the previous extension of ANP Sort (Ishizaka & Pereira, 2017). The GANP-Fuzzy Sorting II is proposed as an extension by integrating the fuzzy logic in the evaluation stage. Konrad Kułakowski from AGH UST, Poland (coauthor Michal Strada from the same institution) presented "**Single Expert Manipulations in the Cardinal Pairwise-comparisons Method**." Astrid Oddershede from the University of Santiago of Chile, (coauthors Luis Quezada, Miguel Angel Rodriguez and Cecilia Montt Veas from the same university) presented "**AHP Model for Assessing Critical Factors Impacting Stadium Security**." Last, but not least, we heard an AHP/ANP and extensions presentation from Luis Quezada, (University of Santiago of Chile) (coauthors Astrid Oddershede, Pedro Palominos, Cecilia Montt Veas and Miguel Angel Gonzalez, all from the same university). Luis Quezada presented "**A Method for Designing a Strategy Map with Scenarios using ANP/AHP**."

In addition to the academic presentations, we also had the opportunity to socialize with friends and colleagues after the long hiatus caused by the pandemic and to enjoy the beautiful views in Portsmouth. An afternoon boat cruise and an authentic British pub experience was held on Wednesday, June 29, 2022.

Delegates enjoying the boat tour

Delegates enjoying the boat tour

How many new ideas are born during discussions onboard the boat, and how many new connections established!

Conference co-organizer Banu Lokman with her son and husband on the boat tour with Jyrki Wallenius

Jyrki Wallenius, awards committee chair of the society, presented the conference chair award to Alessio Ishizaka (Chair) during the banquet dinner at a beautifully restored historic boathouse on June 30, 2022. He also recognized Banu Lokman (Co-chair) and Dylan Jones (Program Chair). Watch Jyrki and his sense of humor, presenting the award in the following video!

https://www.youtube.com/watch?v=zq_UTkuCQSM

Conference awardees with Jyrki Wallenius and Matthias Ehrgott (president of the society)

At the closing session, future conferences related to MCDM were presented.

Alessio Ishizaka announced the 7th DySES conference to be held October 5-7, 2022 in Rouen (France); Birsen Karpak from Youngstown State University, presented ISAHP 2022, a web conference, to be held December 15-18, 2022; Fouad Ben Abdelaziz from Neoma Business School announced MCDM 2024 to be held in person in Hammamet,

Tunisia in late May or early June. The MCDM community has many opportunities to exchange ideas in France and Tunisia as well as over the web. ISAHP promises you a different web conference; we hope you will enjoy it. Looking forward to seeing you at future conferences.