EWG-MCDA
EURO Working Group on Multicriteria Decision Aiding
Groupe de Travail Européen Aide Multicritère à la Décision
NEWSLETTER
BULLETIN

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Obituary : Peter C. Fishburn (1936-2021)

Peter C. Fishburn has left us on June 10, 2021, in Racine, Wisconsin, at the age of 84.
Peter has been an incredibly prolific contributor to several fields, including decision theory, utility theory, social choice theory, voting theory, operations research, mathematical economics and discrete mathematics. He was the author of eight books among which « Utility theory for decision making » (1970, a classic cited more than 4500 times, according to Google Scholar), « The theory of social choice » (1973), « The foundations of expected utility » (1982). He was one of the promotors of Approval voting (Brams and Fishburn, 1983, 2007). He published over 500 papers with more than 80 different co-authors, including 9 papers with Paul Erdös (hence, Fisburn's Erdös number is 1). His work has been highly influential and recognized. Among other distinctions, the prestigious John von Neumann Theory prize was awarded to him in 1996 « for his contributions to the foundations of choice under certainty, including axiomizations of utilities, subjective probabilities and ordered sets, and to related theories of voting and social choice ».
Peter graduated from Pennsylvania State University in Industrial Engineering in 1958 and was awarded a PhD in Operations Research from the Case Institute of Technology, Cleveland, Ohio, in 1962. After he was a research professor at Penn State (1971-1978), he spent most of his career as a mathematical researcher at Bell Labs in Murray Hill and Florham Park, New Jersey (1978-2001). He retired in 2001.
Peter was married and had three daughters. As a cornet player, he was a member of Penn State Blue Band and continued playing throughout his life. He sang for many years in church choirs with his wife. He reportedly liked to observe birds and gardening.
Besides being a very bright and respected scholar, Peter was also unanimously recognized as an extremely king and righteous person. Listen for instance to the Fishburn memorial panel session featuring Rakesh Sarin and Peter Wakker (https://drive.google.com/file/d/1lyf-LSR-kBrVJ_3l1nJJCpZ3TP3FIrwI/view?usp=sharing).
The work and personality of Peter Fishburn will continue to inspire many of us.

Marc Pirlot

Opinion Makers Section

Proactive Decision-Making Skills Enhance Life Satisfaction and Can Be Trained

There is good news, especially for those who teach or participate in decision-making courses and those who want to have a better life. We have gathered empirical evidence suggesting that, firstly, good, proactive decision-making skills can be trained and, secondly, these skills explain a substantial share of the variance of life satisfaction. Taken together, by participating in decision-making courses actively, you can learn how to make better decisions, and as a consequence, you are more satisfied with your life. (If it increases your satisfaction, you can watch this video instead of reading)
Most individuals and organizations can be characterized as reactive in their decision-making. Decision situations are seen as decision problems that have to be solved. The most apparent alternatives or alternatives that have proven suitable in similar decision situations are often identified with little effort. Most of the effort is spent in evaluating these alternatives. In doing so, it is by no means ensured that the best possible alternatives are available for selection.
In contrast, Ralph Keeney (1992) suggests spending more effort to identify attractive alternatives since only alternatives that have been identified before can later be chosen. Individuals or organizations should identify their values, in other words, what they care about, and translate them into objectives. These objectives should be used for identifying more and better alternatives systematically. Instead of solving decision problems, decisions should be seen as opportunities that can be proactively developed. Keeney assumes that value-focused thinking is beneficial for decision-makers.
In the last decades, several studies produced empirical evidence suggesting the usefulness of value-focused thinking. Keeney recommends identifying objectives and using them to create alternatives systematically. For that, you need to be aware of your objectives. However, Bond, Carlson, and Keeney (2008) found empirical evidence suggesting that individuals and organizations are not aware of their objectives. If you do not know your objectives, how can you make good decisions?
In a paper in which I had the great pleasure of sharing the authorship with Ralph Keeney, we found empirical evidence suggesting that individuals and organizations are not aware of their alternatives (Siebert and Keeney 2015). More than fifty percent of the participants were not able to identify their best alternative without any help. How can you make good decisions if you are not aware of your potentially best alternatives? However, there is good news. Prompting with objectives helps to identify more and better alternatives. These and other research are essential pieces of the puzzle of investigating the benefits of methods suggested in value-focused thinking. However, there was still the need to capture the essence of decision-makers' value-focused skills and personality traits to analyze the consequences on a broader level.

In 2013, I started this endeavor with my friend and colleague Reinhard Kunz. Later, our Ph.D. student Philipp Rolf has joined and energized the team. We have conducted several studies with more than 7,000 participants and have published our results in three papers in the European Journal of Operational Research.

In the first paper, we developed and validated the scale of Proactive Decision-Making (Siebert and Kunz 2016). This scale describes the degree of proactivity of individuals in decision situations with six dimensions. Four dimensions concern cognitive skills integrate the ideas and concepts of value-focused thinking and decision quality into the Scale of Proactive Decision Making: systematical identification of objectives, systematical identification of information, systematical identification of alternatives, and using a decision radar. Two dimensions cover proactive personality traits: striving for improvement and showing initiative. We explained 50% of the variance of decision satisfaction with proactive decision-making.

In the second paper, using a structural equation model, we showed that proactive decision-making explains a substantial share of the variance in life satisfaction (Siebert, Kunz, and Rolf 2020). In other words, if you are more proactive in your decision-making, you are more satisfied in your life.

In the third paper, we applied the proactive decision-making scale a priori and ex-post to analyze the impact of three different types of decision-making courses: A massive online course by Carl Spetzler (NovoEd's online courses, DQ 101: Introduction to Decision Quality), a massive onsite course by Rüdiger von Nitzsch at the RWTH Aachen University, and several of my small onsite courses at the Management Center Innsbruck in Austria (Siebert, Kunz, and Rolf 2021). In line with the hypotheses, the degree of the proactive personality traits remained stable, while the degree of the proactive cognitive skills improved significantly through the training.

Our results substantiate the assumption that decision training is of practical relevance. The decision-making courses increased participants' (tacit) knowledge about effective decision-making, self and peer-reported proactive decision-making behavior, and general satisfaction with their decision-making. We argue that it would be beneficial both for potential participants and for training providers to deplore the dwindling number of decision-making courses being offered publicly. Hence, OR scholars, in particular, should be encouraged to advocate for incorporating such general decision-making courses into OR-related degree programs or similar professional development initiatives. But, of course, even the most sophisticated OR methods cannot entirely compensate for underdeveloped individual decision-making skills.

Decision-making courses are also missing outside our field. For example, there are business schools that do not offer any courses on decision-making to their students. Yet, what is one of the core tasks of managers? Making decisions! Therefore, we recommend universities, colleges, and schools to include decision-making courses in their curriculum. At the Management Center Innsbruck, I have already successfully created such courses in five study programs. My students enjoy them very much, knowing that actively participating in the course and reflecting on the material has the potential to make their life better.

In addition, I have created the initiative KLUGentscheiden (smart deciding) in Germany, which educates high school students in decision-making. Preliminary results indicate that they enhance their proactive cognitive skills and feel empowered. This is very motivating. Decision education is a key for our future. The research results I have shared with you are just the beginning. There is a lot to do. If you are interested in joint work, please contact me to discuss perspectives.

Finally, I like to thank the research community for many precious inputs. The discussions with colleagues during the meetings of the Decision Analysis Society and the EURO working group on Behavioral Operations Research were very fruitful and energized our research. Mainly, I like to thank the anonymous reviewers who have provided many useful suggestions to substantially improve the quality of our papers. In the end, I like to cite Ralph Keeney: The only way to exert control over your life is through your decision-making. Take advantage of this opportunity.

Johannes Siebert

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Bond, SD; Carlson KA; Keeney RL 2008. Generating Objectives: Can Decision Makers Articulate What They Want? *Management Science*, 54(1), 56-70, https://doi.org/10.1287/mnsc.1070.0754

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Siebert, JU; Keeney RL 2015. Creating More and Better Alternatives for Decisions Using Objectives. *Operations Research*, 63(5), 1144-1158, http://dx.doi.org/10.1287/opre.2015.1411

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Siebert, JU; Kunz, R; Rolf P 2020. Effects of Proactive Decision Making on Life Satisfaction. *European Journal of Operational Research*, 280(1) 2020, 1171-1187, https://doi.org/10.1016/j.ejor.2019.08.011

Siebert, JU; Kunz R, Rolf P 2021. Effects of decision training on individuals' decision-making proactivity. *European Journal of Operational Research*, 294 (1), 264-282, https://doi.org/10.1016/j.ejor.2021.01.010

About the 92nd meeting of the EWG-MCDA in Krakow, Poland.

Figure 1 opening ceremony of the 92nd Meeting of EURO Working Group on Multicriteria Decision Aiding

The 92st meeting of the EURO Working Group on Multicriteria Decision Aiding (EWG-MCDA) was held from September 16 to 18, 2021 jointly in Krakow and at Zoom. The meeting was hosted by Cracow University of Economics. The main theme of the meeting was “Multi-Criteria Decision Analysis as a transdisciplinary science”. In the call for papers, we have stated: “Transdisciplinary research (in accordance with the scientific paradigms of post-normal or Mode-2 science) aims to address the complexity of real-world problems by bringing together scholars and practitioners through processes of knowledge co-production across diverse scientific disciplines and societal groups, which place social learning at their core.”
Stanisław Mazur, the Rector the Cracow University of Economics opened the 92st meeting of the EWG-MCDA. It is an honour to host the EWG-MCDA meeting at the Cracow University of Economics, MCDA methods help in answering many questions posed by economists. Rector welcomed the Euro Group Coordinators, Roman Slowinski and Milosz Kadzinski, who were on site, and Salvatore Greco and José Rui Figueira, who were online, Rector welcomed all participants on site and online. Just after Roman Slowinski presented the Bernard Roy Awards Winners: Salvatore Corrente for 2020, who was online and Matteo Brunelli for 2021, who was on-site. Chairs for the Bernard Roy Awards was Roman Słowiński together with Nuria Agell and Irene Abi-Zeid.

Figure 2 Bernard Roy Awards: Roman Slowinski and Matteo Brunelli (2021)

The keynote talk was given by prof. Roland W. Scholz from ETH Zurich, the title was "History, roles, and challenges of MCDA in transdisciplinarity". Prof. Roland W. Scholz described the role of MCDA in transdisciplinary processes, he pointed the challenge based on his rich experience. The keynote lecture as well all the presentations of the participants were very interesting, which is proven by long discussions afterwards. Topics include the analysis of multicriteria decisions, presentation of theoretical research on new methods supporting these decisions and their practical application. The 92nd meeting was a hybrid forum for the exchange of international experiences in multi-criteria decision aiding, the program and the book of abstracts can be found at https://if.uek.krakow.pl/ewg-mcda/.
After long scientific discussions the participants who came to Krakow were able to explore the city with its priceless historical monuments of culture and art. On the first day we could taste Polish wine and Polish cuisine in the "Miód i Malina" restaurant with the music played by students of the Cracow University of Economics, who also graduated from the jazz school. On the second day we visited the Museum of the Czartoryski Princes, where Leonardo da Vinci's Lady with an Ermine stays for centuries. We went to St Mary's Basilica where we listened to a concert by a boys' choir. Then we had a walk around Krakow with our guide Kasia Socha, who at the end sang us a Serbian folk song as a prelude to the next meeting in Belgrade. On Saturday we visited the Wieliczka Salt Mine, almost 700 years old mine, which is at the UNESCO list from 1978.
On behalf of organizing group, I would like to thank all the participants, especially those who came to Krakow, thanks to you the conference was hybrid. It was a great privilege to host the 92nd meeting of the EWG-MCDA, Cracow University of Economics has become a part of the long, beautiful history.
Looking forward to seeing you in Belgrade,
Ela Kubinska

CONFERENCE PROGRAMME

Session 1: Novel MCDA Methods
Chair: Michele Fedrizzi

Salvatore Greco, Sally Giuseppe Arcidiacono, Salvatore Corrente
Multicriteria decision aiding using representative value functions (presentation online)

Mohammad Ghaderi
Preference disaggregation: a probabilistic view (presentation on-site)

Konrad Kułakowski
Ranking methods for incomplete PC matrices (presentation on-site)

Sarah Ben Amor, Ahmet Kandakoglu
A clustering model for multiple criteria decision aiding with mixed evaluations (presentation online)

Session 2: Participatory MCDA approaches
Chair: Jose Rui Figueira

Elżbieta Kubińska, Magdalena Adamczyk, Mariusz Andrzejewski, Stelios Rozakis

Incorporating the status quo effect into the decision making process: the case of municipal companies merger (presentation on-site)

Ariane Marais, Irène Abi-Zeid, Owen Waygood
A method to identify, characterize and engage relevant stakeholders in decision processes (presentation online)

Session 3: MCDA as a transdisciplinary science
Chair: Stelios Rozakis

Athanasios Spyridakos, Dimitrios Alexakis, Isaak Vryzidis, George Varelidis, Nikos Tsotsolas, Thimios Kagiaras,
MCDA methodological frame for the environmental discretization of the refractory materials waste qualities (presentation online)

Christine C. Huttin, Jerry Hausman
Comparison of simulated approach and shrinkable estimators for physicians 'choice models (presentation online)

Session 4: MCDA as a transdisciplinary science 2
Chair: Salvatore Greco

Ewa Roszkowska, Tomasz Wachowicz, Marzena Filipowicz-Chomko
Gender, decision-making style, and expectations regarding the representation of preferential information in decision support systems (presentation on-site)

Pooja Mohanty, Núria Agell, Mònica Casabayó
A Decision-Making Approach to Understand Innovator-group of Customers (presentation on-site)

Session 5: MCDA as a transdisciplinary science 3
Chair: Salvatore Corrente

José Rui Figueira, Duarte Caldeira Dinis, Ângelo Palos Teixeira
A multiple criteria approach for ship risk classification: An alternative to the Paris MoU Ship Risk Profile (presentation online)

Antoine Mallégol, Patrick Meyer, Sophie Loyer
A hydrographic risk assessment methodology integrating the user's preferences: application to a use-case in the English Channel (presentation on-site)

Arwa Khannoussi, Julian Le Deunf, Patrick Meyer, Laurent Lecornu, John Puentes
Integrating user preferences in the automatic quality assessment of hydrographic surveys (presentation on-site)

Session 6: MCDA as a transdisciplinary science 4
Chair: Maria France Norese

Maria Franca Norese
Which are the results of an MCDA intervention? Some reflexions (presentation online)

Amiram Moshaiov
Multi-Criteria Decision-Making on Conceptual Solutions (presentation online)

Najeeb Abdulaleem
E-optimality conditions for E-differentiable vector optimization problems under E-B-invexity (presentation on-site)

MCDA Research Groups

INCT-INSID - National Institute of Information and Decision Systems

Danielle Costa Morais, Rodrigo Ferreira

NATIONAL INSTITUTE OF INFORMATION AND DECISION SYSTEMS

INCT-INSID (www.insid.org.br) is a cooperative, inter-institutional, scientific network with national and international extra-mural outreach for developing advanced research and applications on decision making and aiding (including multicriteria and multiobjective methods – MCDM/A, and group decision and negotiation – GDN). INCT-INSID is led by Prof. Adiel Teixeira de Almeida of the Universidade Federal de Pernambuco - Brazil and brings together associate labs of several Brazilian universities and a selective group of international partners (www.insid.org.br/international-associate-partners). Figure 1 shows the international scope of the Brazilian Institute including international research centers on three continents (America, Europe and Asia).

Figure 1 – World map showing where INCT-INSID’s international partners are located

Figure 2 indicates the location in Brazil of the institutions that are participating as INCT-INSID partners. It is important to mention that Brazil is a country with continental dimensions. Nevertheless, most of the population, and important research centers, are concentrated on the coast. This may explain why so many of our partners are located in them.

Figure 2 – Map of Brazil indicating states with INCT-INSID’s national partners

Since 2014, INCT-INSID's main missions are: Research; Training of People and Knowledge transfer to society at large and to the public and private business sector.

Research

INCT-INSID focuses on two kinds of research:

- Research related to methodological advances in MCDM-A and GDN, which involves the building of analytical models to support the decision, enabling the development of decision support systems (software), in frontier areas of science, thereby bringing an international standard of competitiveness to this area of knowledge; and,

- Research related to constructing decision models, which culminates in applying these methods and software in several contexts, such as Environmental Technologies and Mitigating Climate Change; National Defense; Public Security; alternative sources of Renewable Energy; Nuclear Research; and Information Technology. Sustainability is another issue embedded in all themes covered, and is considered an important factor that is present in all research areas and research topics.

INSID’s Program involves research topics with high scientific impact, revealed by scientific advances that have already been achieved by members of the group, and verified by their publications in scientific journals with high impact in these areas (www.insid.org.br/production-and-members)

As a result, competitive and relevant research for the MCDM-A and GDN community are promoted, given the number of priority themes for the world covered, thereby leading to reducing the scientific-technological gap in decision support, while expanding and consolidating Brazil's leadership on this theme. The products of INCT-INSID can be found at www.insid.org.br/products

Training of People

- Multicriteria Decision Course – INCT/INSID

As part of Human Resources training mission of INCT-INSID, a multicriteria decision course was created in 2020. The content of the course follows the basic structure adopted by the MCDM Summer School, which has been organized by the MCDM International Society since 1983. In the MCDM Summer School, there are 15 lecturers appointed by the Society and the participants are 50 doctoral students from several countries which typically takes place in a different country in the world over 2 weeks. Since 2016, two INCT-INSID members have worked (or are currently working) at the MCDM Summer School. The course is concept/case-based. It has an initial conceptual part, and then each student works on constructing cases that will be used to demonstrate how to solve MCDM problems based on the concepts learned during the course.

The INCT-INSID Multicriteria Decision course has a total workload of 60 hours, and covers the main topics related to Multicriteria Decision, including: Introduction to MCDM/A; Multi-attribute Value Theory; Outranking Methods; Construction of Decision Models; Modeling and Structuring of problems; Multi-attribute Utility Theory; Multi-Objective Linear Programming; Multiobjective Evolutionary Optimization; Introduction to Group Decision and Negotiation.

The teaching methodology consists of live lectures, in synchronous format, via Google Meet and activities via Google Classroom. During the course, students develop a practical case of building a multi-criteria decision model. There is a tutoring mechanism with groups of teachers for feedbacks. The cases are presented to the whole class at the end of the course. This case development activity is the main form of evaluation of students taking credits, in addition to which there are other activities throughout the course.

The first class of the course (Class 1/2020) took place from August to November 2020 and had a total of 47 students, 34 from PUC-PR and 13 from UFRN. A total of 13 faculty taught the course, 7 from UFPE, 4 from PUC-PR and 2 from UFRN.

The second class of the course (Class 1/2021) took place from March to July 2021, and had the participation of a total of 54 students from 18 partner institutions. A total of 18 faculty taught on the course, from the following institutions: UFPE, PUC-PR, UFRN, UFF, UNICAMP, ITA and PUC-MG:

The third class of the course (Class 2/2021) started in July/2021 and is in progress, with completion expected in October/2021. There are a total of 58 students from 14 partner institutions. A total of 18 faculty are contributing to the course, from the following institutions: UFPE, PUC-PR, UFRN, UFF, UNICAMP, ITA and PUC-MG:

Future classes will be created on demand, and preparations for a new class to start in early 2022 are already underway. If you would like to ask for a course, write to secinsid@insid.org.br.

- Course of Strategic Decision Making – Politecnico di Milano

Two INCT-INSID members participated in the “Course of Strategic Decision Making” offered by researchers from the Politecnico de Milano, Italy, from 16 to 20/07/2021. The topics covered were: Elicitation of Preferences; Meaning of weights in the additive model. The course was delivered in a remote, synchronous format via MS Teams.

Knowledge transfer to society at large and the public and private business sector

To attend to the mission of disseminating knowledge, three actions were launched: the INSID Magazine, the YouTube channel and the INSID Meeting.

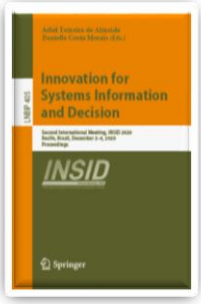
- *INSID Magazine*

The INSID magazine aims to disseminate important scientific advances by presenting them in an accessible and easy language for the general public and thus for society at large (www.insid.org.br/insidmagazine).

We endeavor to ensure it is graphically attractive, and therefore supports presenting the research results of INCT-INSID members who have caused - or may cause - impacts on society. By using simple language, written in Portuguese, and by having an attractive design, INSID Magazine seeks to increase its reach in society, and the more widespread use of MCDM/A and GDN concepts in the industrial and business sectors.

It has a digital format, and the goal is to publish a new edition every six months.

- INSID Meeting



The INSID meeting (www.insid.events) is an annual International Conference on INnovation for Systems Information and Decision. This meeting provides a forum for those who have been working on developing advanced research and applications on MCDM-A and GDN since 2008, under the acronym SIDS.

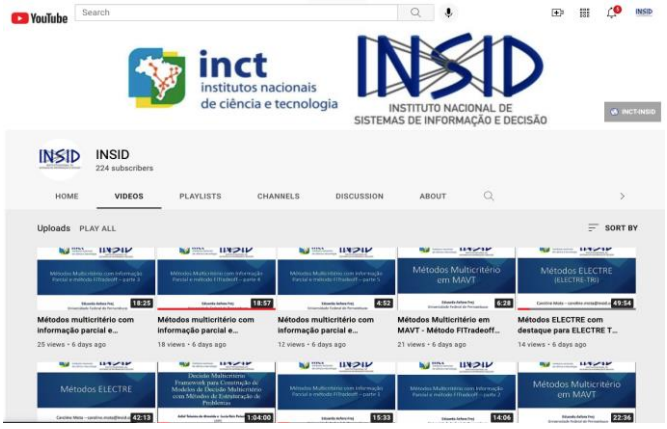
The first INSID was held in 2019 in Natal, Rio Grande do Norte, Brazil. The second INSID took place at the Federal University of Pernambuco in Recife, Pernambuco, Brazil, from December 02 -04, 2020. Due to the COVID-19 Pandemic, INSID 2020 happened virtually. INSID 2021 is being organized to be held in Recife/Brazil from December 01 – 04, 2021 (www.insid.events/insid2021). We hope that these events will prompt new collaborations among all participants.

Long papers presented at INSID 2020 were published as Lectures Notes in Business Processing (LNBIP), Springer (INSID 2020 was the first for which there was a volume of proceedings in the LNBIP Series). Short papers, extended abstracts and abstracts were published in local proceedings. The INSID Meeting was attended by more than 200 people, including researchers and graduate students from different teaching and/or research institutions from different regions of Brazil and countries such as France, China, Sweden, Germany.

An INSID Meeting provides a stimulating environment for the dissemination of state-of-the-art and knowledge about INnovation for Systems, Information and Decision and fosters discussions among participants, the exchange of ideas and critical comments.

- INSID YouTube channel

The INSID YouTube channel presents a set of classes, lectures and products developed by the institute. The channel can be accessed at www.youtube.com/inctinsid. The newly created channel already has more than 200 subscribers and has had 1600 views.



Software

Latest developments of DESDEO
An Open-Source Software Framework for Interactive Multiobjective Optimization Methods

Kaisa Miettinen, Giovanni Misitano, Bhupinder Singh Saini, Bekir Afsar, Babooshka Shavazipour, Giomara Lárraga, Johanna Silvennoinen. University of Jyvaskyla, Faculty of Information Technology, P.O. Box 35 (Agora). FI-40014 University of Jyväskylä, Finland

SUMMARY
DESDEO is an open source software framework developed in Python at the University of Jyväskylä. The objective of DESDEO is to bring interactive multiobjective optimization methods easily available and accessible. It has a modular structure, which makes adding new contents convenient: one can utilize existing modules when implementing new methods and only implement those parts that are not there yet. It contains both scalarization-based (MCDM type) and evolutionary (EMO type) methods. Having different methods in the same environment enables method comparison as well as switching the method during the interactive solution process.
The main structure of the current DESDEO was released around a year ago. Since then, DESDEO has been under steady development, resulting in implementations of new methods, improved documentation, advancements in graphical user interfaces and visualizations, and more. DESDEO is hosted on GitHub (https://github.com/industrial-optimization-group/DESDEO). As a modular framework, DESDEO has been divided into packages, which may be used either individually or together. The structure of the packages in DESDEO can be seen in Figure 3.

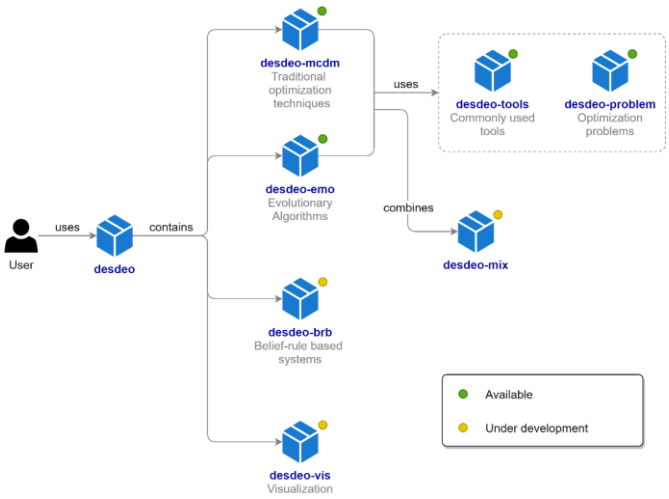


Figure 3. DESDEO’s modular structure.

As mentioned, DESDEO contains two types of interactive methods. On the MCDM frontier, DESDEO has currently support for the following methods:

- Methods in the NAUTILUS family (NAUTILUS [1], NAUTILUS 2 [2], E-NAUTILUS [3] and NAUTILUS Navigator [4])
- Synchronous NIMBUS [5]
- Reference Point Method [6]
- Pareto Navigator [7]

On the other hand, the following interactive EMO methods have been implemented in DESDEO:

- Interactive RVEA [8]
- Interactive version of NSGA-III [8, 9]
- Interactive version of MOEA/D [8, 10]
- IOPIS [11]

These methods can be found in DESDEO packages desdeo-mcdm and desdeo-emo, respectively. Besides interactive methods, DESDEO contains noninteractive methods like epsilon-constraint method, RVEA, NSGA-III and MOEA/D. In addition to optimization methods, DESDEO supports the modeling of different kinds of multiobjective optimization problems and scalarization. These features are found in the packages desdeo-problem and desdeo-tools, respectively.
Different features have been implemented in DESDEO in a way that allows their reuse and modification. This makes DESDEO a perfect tool for experimenting and (further) developing existing or new interactive multiobjective optimization methods. Combining different methods is also possible. For example, one can generate a representation of Pareto optimal solutions for an MCDM method that needs such an input. Combining methods like this is seamless in DESDEO and one of its greatest assets.

LATEST DEVELOPMENTS

In interactive multiobjective optimization methods, one of the greatest challenges is facilitating the interaction of a decision maker and a method. Interactive methods, problems to be solved, and decision makers are different, which adds a multitude of dimensions to this challenge. Therefore, we have recently developed a modular software library for

implementing interfaces to be used to interact with interactive methods in DESDEO. With the library’s modularity, we aim to provide means for researchers and practitioners to build interfaces that best fit their needs. After serious consideration, we decided to develop our interfaces as web applications implemented in TypeScript and utilizing React and D3.

While our software library for graphical interfaces is not yet ready for an official release, it has already been utilized in a research project to test the usability and perception of interactive methods with human participants. Moreover, a summer trainee in our research group, Juuso Pajasmaa, has been actively working on the library contributing to it greatly. An example of an interface developed using our library can be seen in Figure 4.

In a year, we have moved from prototyping new graphical interfaces in plotly-dash to developing our very own visualizations and interfaces. For us, this has been a huge step!

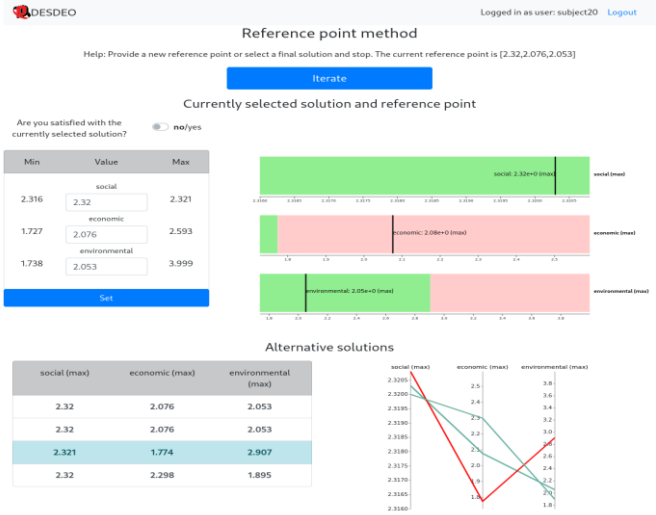


Figure 4. The interface developed for the reference point method with four distinct components. Top: a reference point may be given by either manually typing aspiration levels for each objective (left) or by clicking on horizontal bars (right). Bottom: alternate solutions computed by the reference point method can be explored either in a tabular form (left) or on a parallel axes plot (right). The components are also linked, meaning that they reflect the changes that happen in other components (when applicable).

Another notable recent development regarding DESDEO has been exploring physical interfaces to control interactive multiobjective optimization methods. The mastermind behind this endeavor has been our other summer trainee Stefan Otayagich. His work is novel to say the least. Using Arduinos, some electrical components, and a bit of ingenuity, Stefan was able to build modular physical interface components, which can be re-arranged, added, or removed to one’s liking. This allows for the layout of the physical interface to be tailored to meet different needs. To control interactive methods, each physical module can contain a slider, button, switch, etc. New modules may also be easily developed. Stefan gave a seminar talk about his work in one of our seminars. The recording can be found on YouTube (DEMO Seminar by Stefan Otayagich: Physical interfaces for interactive methods), while the code related to his work is available on GitHub (https://github.com/phoopies/DesdeoInterface). An example of the physical interface can be seen in Figure 5.

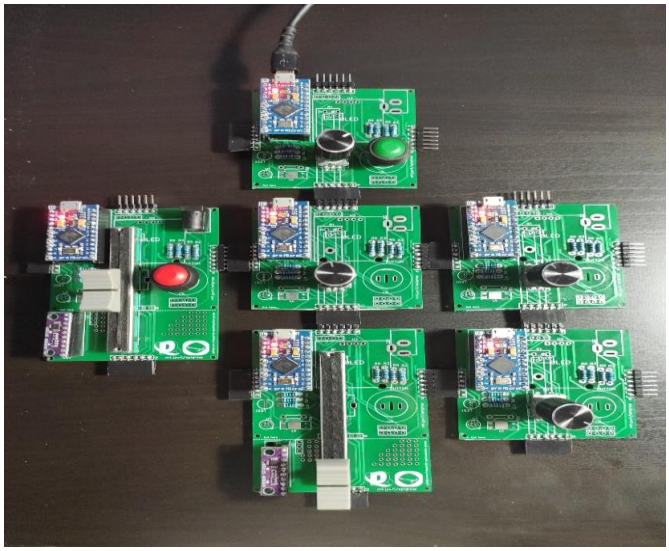


Figure 5. An example of a modular physical interface used to control interactive multiobjective optimization methods. Top: rotating knob with green button. Middle: slider with red button (left), rotating knob (center), rotating knob (right). Bottom: slider (center), rotating knob (right). The layout of the interface may be changed by connecting modules to each other using the pins and sockets present on the sides of each module.

For additional news regarding the DESDEO development and future updates, we invite interested readers to follow the news section of the DESDEO website https://desdeo.it.jyu.fi/news.

NEW VERSION OF DESDEO'S DOCUMENTATION

We have updated the documentation of the DESDEO framework and invite readers to have a look at the latest version at https://desdeo.readthedocs.io/en/latest.

Thanks to the open source nature of DESDEO, also others besides the core developers are welcome to use it and add contents. We welcome new contributions! A recording of a seminar talk of Giovanni Misitano and Bhupinder Saini is available on YouTube (https://youtu.be/JCZRBx55KBQ). It contains useful hints to those who wish to work with DESDEO.

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complex multiobjective optimization problems based on the NAUTILUS method”, European Journal of Operational Research 246, 218-231, 2015, doi: 10.1016/j.ejor.2015.04.027.
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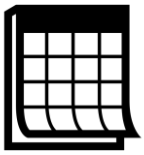


Forthcoming meetings

(This section is prepared by Carlos Henggeler Antunes, ch@deec.uc.pt)

27-30/10/2021

META'2021 International Conference on Metaheuristics and Nature Inspired Computing

ONLINE/Marrakech, Morocco

https://meta2021.sciencesconf.org/

3-5/11/2021

The 7th International Conference on Algorithmic Decision Theory - ADT 2021

Toulouse, France

https://www.irit.fr/ADT2021/

29/11-1/12/2021

Joint ALIO/EURO International Conference 2021 on Applied Combinatorial Optimization

Viña del Mar, Chile

https://www.alioeuro2021.cl

10-17/12/2021

EURO PhD School - Reinforcement Learning Applied to Operations Research

Marienheide, Germany

http://www.stochmod.eu/EPS/

13-14/12/2021

MCO2021 - The 4th International Conference on Modelling, Computation and Optimization in Information Systems and Management Sciences

Hanoi, Vietnam

https://mco2021.event.univ-lorraine.fr/

13-16/12/2021

IEEM 2021

Marina Bay Sands, Singapore (mixed mode)

http://www.ieem.org/

13-14/12/2021

[MCO2021] The 4th International Conference on Modelling, Computation and Optimization in Information Systems and Management Sciences

Hanoi, Vietnam

https://mco2021.event.univ-lorraine.fr/

1-4/3/2022

International Network Optimization Conference 2022 (INOC)

Aachen, Germany

https://sites.google.com/view/inoc2022/

7-9/3/2022

XIV Chilean conference on Operations Research, OPTIMA

Chile

https://portal.ucm.cl/optima2021

April 2022

93rd Meeting of EURO Working Group on MCDA

Belgrade, Serbia

http://www.cs.put.poznan.pl/ewgmcda/

20-22/4/2022

EvoCOP 2022 - The 22nd European Conference on Evolutionary Computation in Combinatorial Optimisation

TBC

http://www.evostar.org/2022/evocop/

5-8/6/2022

CORS/INFORMS International Conference 2022

Vancouver. Canada

http://meetings2.informs.org/wordpress/2022international/

7-10/6/2022

SEIO 2022: 39th Spanish Conference on Statistics and Operational Research and 13th Conference on Public Statistics

Granada, Spain

https://www.seio2021.com

9-11/6/2022

ECCO XXXV - CO 2022 Joint Conference

Saint-Petersburg, Russia

https://ecco2022.euro-online.org/

11-24/6/2022

EURO Summer Institute on Location Science

Edinburgh, UK

https://www.maths.ed.ac.uk/ESI2022/index.html

13-22/6/2022

EURO PhD School on Data Driven Decision Making and Optimization

Seville, Spain

https://congreso.us.es/epsdata/

26/6 – 1/7 2022

26th International Conference on Multiple Criteria Decision Making

Portsmouth, UK

https://mcdm2021.org/

3-6/7/2022

EURO 2022

Espoo, Finland

https://euro2022espoo.com/

25-29/7/2022

XVI International Conference on Stochastic Programming (ICSP2022)

California, USA

https://gsm.ucdavis.edu/xvi-international-conference-stochastic-programming-2022

14-19/8/2022

ISMP 2022

Beijng, China

http://ismp2022.csp.escience.cn/dct/page/1

31/8-2/9/2022

ODS 2022 International Conference on Optimization and Decision Science

Florence (Italy)

http://www.airoconference.it/ods2022/

12-16/9/2022

paraoptXII: 12th International Conference on Parametric Optimization and Related Topics

Augsburg, Germany

https://www.uni-augsburg.de/de/fakultaet/mntf/math/prof/opt/team/duer/paraopt/

September 2022

94th Meeting of EURO Working Group on MCDA

Agios Nikolaos, Greece

http://www.cs.put.poznan.pl/ewgmcda/

16-19/10/2022

INFORMS Annual Meeting

Indianapolis, USA

https://meetings2.informs.org/wordpress/indianapolis2022/

30/10-3/11/2022

15th International Conference on Advanced Systems in Public Transport (CASPT2022)

Tel-Aviv, Israel

http://www.caspt.org/

April 2023

95th Meeting of EURO Working Group on MCDA

Jaén, Spain

http://www.cs.put.poznan.pl/ewgmcda/

24-28/7/2023

XVI International Conference on Stochastic Programming

California, USA

https://gsm.ucdavis.edu/faculty-and-research/faculty-conferences/xvi-international-conference-stochastic-programming

September 2023

96th Meeting of EURO Working Group on MCDA

Paris, France

http://www.cs.put.poznan.pl/ewgmcda/

April 2024

97th Meeting of EURO Working Group on MCDA

Madrid, Spain

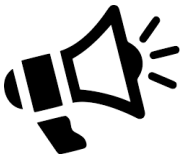
http://www.cs.put.poznan.pl/ewgmcda/

30/6-4/7/2024

EURO 2024

Copenhagen, Denmark

https://www.euro-online.org



Announcements and Call for Papers

Call for the "Bernard Roy Award of the EURO Working Group on Multiple Criteria Decision Aiding" (Bernard Roy Award of EWG MCDA)

Policy

-The Bernard Roy Award of EWG MCDA is a recognition conferred to a researcher under 40 years old for an outstanding contribution to the methodology and/or applications of Multiple Criteria Decision Aiding (MCDA).

-The award will be officially bestowed at the opening session of the 94th EWG MCDA meeting, september 2022, Agios Nikolaos, Greece, if there is a suitable candidate. In this case, following a presentation of the competition by the chair of the Jury, the laureate will be invited to give a talk.

Award

The laureate then will receive the financial award (1000 EUR) and the diploma.

Eligibility

-The Bernard Roy Award of EWG MCDA shall be awarded for a body of work in MCDA, preferably published over the last decade. Although recent work will not be excluded, care shall be taken to allow the contribution to stand the test of time.

-The potential award recipient shall have a recognized stature in the MCDA community. Significance, innovation, depth, and scientific excellence shall be emphasized.

Nominations

-Candidates can be nominated by any three members of the EWG MCDA.

-A candidature for the Bernard Roy Award of EWG MCDA is composed of the nomination letter along with a recent and detailed CV, up to 5 best publications, as well as a self-description of the achievements up to 3 page long in a standard manuscript format. The nominations must be sent to the Jury chair by the due date of June 30, 2022.

Selection process

-Only one award may be assigned on each occasion.

-One person may receive the award at most once in her/his lifetime.

-The jury evaluates the nominees essentially on the basis of their scientific activities (papersin top journals, editorials, relevance of methodological proposals and/or applications...).

Jury

-The jury for the current edition is composed of Professors Yannis Siskos (chair), Sara Ben Amor, Maria Franca Norese, Salvatore Greco and Roman Słowiński.

Timing

-Deadline for nominations: June 30, 2022.

-The Jury chair informs the EWG coordinators who invite the laureate to the meeting: July 31, 2022.

-Preparation of the diploma by the EWG coordinators. Presentation of the laureate and her/his talk during the EWG

MCDA Autumn meeting. An electronic copy of the laureate's presentation handed over to the EWG coordinators will be made available on the EWG on MCDA Web Site.

Applications should be sent to Yannis Siskos at ysiskos@unipi.gr.

Call for *New Editor* of the Article Harvest Section in the Newsletter of the Euro Working Group on MCDA and in the International Society on MCDM Newsletter

We are looking for a dedicated, motivated, and reliable editor for the article harvest section in the newsletter of the Euro Working group on MCDA and in the International Society on MCDM newsletter. Especially for Ph.D. students or young postdocs at the beginning of their career, it could be an exciting opportunity to interact with our members and become known by many members. Out of my own experience, I can tell you that this could be very beneficial. Some discussions started with "hey, you are the guy with the newsletter with the nice pictures on the cover lead to many things which were very helpful in my career;-). In addition, voluntary work is highly appreciated by comities, funders, juries, employers.
Your task is to collect relevant publications of our members in the field of MCDM several per year. By now, the collection is done by hand. However, automated processes in which authors upload to a database are also possible. If you are interested, please send a brief letter of motivation and your CV by November 30th by email to salvatore.corrente@unict.it and Johannes.Siebert@mci.edu.

Call for Papers

International Journal of Financial Engineering and Risk Management

Special Issue: Optimization Methods and Models for Systemic Risk Assessment

This special issue aims to collect contributions on optimisation methods analysing systemic risk assessment from the economic and financial perspectives.

Subject Coverage
Suitable topics include, but are not limited, to the following:
• Optimisation models
• Multiple-objective and multicriteria models
• Complex networks
• Stochastic and deterministic control theory
• Probabilistic models
• Interbanking systemic risk
• Macroeconomic systemic risk
• Epidemic models for risk assessment

Notes for Prospective Authors
Submitted papers should not have been previously published nor be currently under consideration for publication elsewhere. (N.B. Conference papers may only be submitted if the paper has been completely re-written and if appropriate written permissions have been obtained from any copyright holders of the original paper).

All papers are refereed through a peer review process.

All papers *must* be submitted online. To submit a paper, please read our Submitting articles page.

Important Dates
Manuscripts due by: *3 November, 2021*
Notification to authors: *3 January, 2022*
Final versions due by: *3 March, 2022*

Guest Editors:
Prof. Silvia Angilella, University of Catania, Italy
Prof. Roy Cerqueti, Sapienza University of Rome, Italy and London South Bank University, UK

Energies

Special Issue: Energy Security within the Nexus of Risk, Resilience and Sustainability: Antinomy or Panacea?

We are pleased to inform you that we are guest-editing for a Special Issue entitled ***"Energy Security within the Nexus of Risk, Resilience and Sustainability: Antinomy or Panacea?"***, which will be published in Energies (https://www.mdpi.com/journal/energies). Details can be found at the following link:
https://www.mdpi.com/journal/energies/special_issues/Energy_Security_within_the_Nexus_of_Risk

The submission deadline is 31 January 2022.

For further details on the submission process, please see the instructions for authors at the journal website (https://www.mdpi.com/journal/energies/instructions). Thank you in advance for your consideration of this request.

Energies is a fully open access journal. Manuscripts are peer-reviewed, and a first decision is given to authors approximately 17 days after submission. An Article Processing Charge (APC) of CHF 1800 currently applies to all accepted papers.

If you wish to check the fit of your manuscript for this Issue prior to submission, you are welcome to send a tentative title and abstract to the editorial office (Ms. Estelle Chen, estelle.chen@mdpi.com) and you will receive feedback shortly.

We look forward to collaborating with you and to hearing back from you soon.

Guest Editors:
Eleftherios Siskos, Peter Burgherr

Socio-Economic Planning Sciences
Methods and techniques for assessment of health care performance

Socio-Economic Planning Sciences invites submissions that focus on theoretical contributions and innovative application frameworks to assess efficiency, quality, and access to health care systems (HCS) worldwide. For this Special Issue, we are seeking papers that address innovative methods and application frameworks to measure the performance in the health sector in terms of efficiency, quality, and access dimensions, including but not limited to the following topics:
• Measuring the impact of public policies or social programs related to health care systems' performance;
• Health care systems' performance in a variety of scenarios, such as in wealthy and developed nations, or impoverished and social excluded regions;
• Theoretical and methodological challenges in understanding the determinants of health care systems' performance;
• Patterns and trends in health care systems' performance, across time, contexts, and demographic groups;
• Social determinants of health care systems' performance as they relate to demographic changes;
• Contextual determinants of health care systems' performance and health disparities;
• Cross-national perspectives in the examination of health care systems' performance.

The deadline for submissions is **December 31, 2021**. Authors should submit their papers online at https://www.editorialmanager.com/SSM/default.aspx.
When asked to choose article type, authors should stipulate 'Special Issue: Methods and techniques for assessing hospital performance.' In the 'Enter Comments' box, the Special Issue title should be inserted along with any further comments to the editors. All submissions should meet the Socio-Economic Planning Sciences Journal author guidelines.
Early submission is encouraged. The referee process will start upon submission of the paper. Accepted papers will be published individually online as they are accepted before print publication. All inquiries concerning the submission to the special issue will be addressed directly by the Guest Editors. For any query, please contact the Key Guest Editor Diogo Ferreira.
The Guest Editors of this Special Issue are:
Diogo Ferreira (diogo.cunha.ferreira@tecnico.ulisboa.pt),
Ana Camanho (acamanho@fe.up.pt),
José Rui Figueira (figueira@tecnico.ulisboa.pt).

Important dates
Submission deadline December 31, 2021
Editorial and publication September 30, 2022

Detailed information available at the following URL: https://www.journals.elsevier.com/socio-economic-planning-sciences/call-for-papers/methods-techniques-assessment-of-health-care-performance

Guest Editors:
Diogo Cunha Ferreira*, Ana Camanho, and José Rui Figueira

* Key Guest Editor

Recent contributions in brief

(This section is prepared by Salvatore Corrente salvatore.corrente@unict.it)

Tsagkarakis M.-P., Doumpos M., Pasiouras F. (2021). Capital Shortfall: A Multicriteria Decision Support System for the Identification of Weak Banks. *Decision Support Systems* 145, 113526. https://doi.org/10.1016/j.dss.2021.113526.

The global financial crisis affected significantly the soundness of individual banks and the health of the U.S. and European banking system as a whole. Building on the outcomes of past regulatory exercises and decisions to capitalized weak banks, we propose the development of an early-warning system that could serve in the future as an automated decision support system for the continuous monitoring and timely identification of weak banks, subsequently guiding regulatory decisions as for the capitalization needs of banking institutions. At the same time, bank managers could use the model to know in-advance if their bank is developing a profile that is close to the one that would trigger supervisory actions.

Within this context, the proposed approach is based on a multicriteria decision aid (MCDA) technique, namely the UTADIS method, which enables the development of additive models for decision making and prediction purposes in a classification setting. The additive form of the models facilitates their interpretability, which is an important feature for their use in a regulatory context. For comparison purposes we benchmark the UTADIS model against logistic regression, as well as with two widely used measures the SRISK, and the Texas Ratio.

Using a sample of 76 large U.S. and European financial institutions and a set of 22 criteria across different dimensions related to bank-level risk factors, bank-level microeconomic criteria, and banking and financial market aggregate conditions we developed various multi-attribute models to distinguish between banks with capital needs and well-capitalized ones. This allows us to build a decision support framework that captures vulnerabilities from both a micro-prudential and a macro-prudential perspective.

Contact: mdoumpos@dpem.tuc.gr

Daniele P., Sciacca D. (2021). An optimization model for the management of green areas. ***International Transactions in Operational Research,*** **28, 3094–3116.** **https://doi.org/10.1111/itor.12987.**

According to United States Environmental Protection Agency, carbon dioxide is the primary greenhouse gas emitted through human activities. The progressive increase of the world population and all the related activities will cause an increase in CO2 concentrations with consequences like global warming, climate change as well as a progressive environmental degradation, heat stress, storms, air pollution, melting glaciers, sea level rise, and reduced water resources.
A strategy to mitigate the environmental effects of urban pollution is to increase green areas. In many cities some strategies have been planned aimed at improving air quality for the health of the population and some administrations are enhancing infrastructure and transport, thereby promoting the movement through public transport and car sharing. Indeed, by monitoring air quality, if a particular pollutant exceeds a threshold value, it is necessary to act with mitigation strategies. For these reasons, we present an optimization model for the management of green areas in order to find the optimal surface to absorb CO2 emissions of industrialized cities. In our model we consider n cities and m types of green areas depending on their location and their efficacy in absorbing CO2. Our aim is to minimize the total costs incurred by an external institution to adapt the green area surface in each city to its real needs, under come constraints. So, we obtain a minimization problem which is characterized by a Variational Inequality formulation and interpret the meaning of some Lagrange multipliers associated with the constraints. To validate the effectiveness of the model, some numerical experiments, based on real data, were performed, highlighting an insufficient presence of green spaces in many cities of Eastern Sicily (Catania, Messina, Syracuse and Ragusa).

Contact: patrizia.daniele@unict.it

Kazibudzki PT. (2021). On the Statistical Discrepancy and Affinity of Priority Vector Heuristics in Pairwise-Comparison-Based Methods. ***Entropy,*** **23(9):1150.** **https://doi.org/10.3390/e23091150.**

DESCRIPTION OF THE CONTRIBUTION

There are numerous priority deriving methods (PDMs) for pairwise-comparison-based (PCB) problems. They are often examined within the Analytic Hierarchy Process (AHP), which applies the Principal Right Eigenvalue Method (PREV) in the process of prioritizing alternatives. It is known that when decision makers (DMs) are consistent with their preferences when making evaluations concerning various decision options, all available PDMs result in the same priority vector (PV). However, when the evaluations of DMs are inconsistent and their preferences concerning alternative solutions to a particular problem are not transitive (cardinally), the outcomes are often different. This research study examines selected PDMs in relation to their ranking credibility, which is assessed by relevant statistical measures, which are selected intentionally while considering that other non-statistical compatibility indices exist in the literature: e.g., the Garuti index or Saaty compatibility index. These measures determine the approximation quality of the selected PDMs. Hence, theoretical considerations are accompanied by Monte Carlo simulations that apply various scenarios for the PCM perturbation process and are designed for hypothetical three-level AHP frameworks. To the best of our knowledge, for the first time, a statistical foundation has been created to identify situations in which PDMs coincide and their discrepancies can be considered as negligible, and when their discrepancies are statistically significant and they should not be neglected. Hence, the possibility was created for a DM to assess the risk of accepting an ineffective PDM or rejecting an effective PDM—the standard problem known to every statistician and which is very important to each DM during the statistical evaluation of decisional options; i.e., statistical alternative hypothesis testing. The ranking of the PDMs evaluated in the manuscript was also presented in this research paper.

Contact: p.kazibudzki@po.edu.pl

Mendas, A., Mebrek, A. & Mekranfar, Z. (2021). Comparison between two multicriteria methods for assessing land suitability for agriculture: application in the area of Mleta in western part of Algeria. ***Environment, Development and Sustainability, 23, 9076-9089.*** **https://doi.org/10.1007/s10668-020-01012-5.**

This study aims to present a comparison between two multicriteria decision-making methods ELECTRE (Elimination Et Choix Traduisant la REalité) Tri and AHP (Analytic Hierarchy Process), fully integrated in a GIS, to assess land suitability for agriculture. The developed system is able to direct and assist the decision-maker throughout the decision process. The coupling of GIS and MCDM makes it possible to fill their respective gaps: on the one hand, the difficulty for GIS to take into account the inherent multicriteria dimension of decision problems, on the other hand the limits of MCDM when it comes to represent the spatial dimension of the problems. Twelve criteria grouped in five factors were used in this study. An application has been carried out on the area of Mleta in Algeria. Two land suitability maps for durum wheat have been produced by the two procedures (optimistic and pessimistic) available in ELECTRE Tri, and another map has been obtained by AHP. The obtained results were compared with each other and with the results obtained by the classic method. After the comparison between the obtained results, it was apparent that the optimistic procedure of ELECTRE Tri can be adapted to the classification mode used by FAO and more appropriate to identify the land suitability for agriculture of a defined type of culture than AHP despite its complexity given the large number of required parameters. The subjective parameters available in ELECTRE Tri make it possible to take into account the imperfections that may

characterize data. Another advantage of this method lies in the way that the preferences of decision-makers are aggregated, and the potential alternatives are assigned to predefined categories.

Contact: mendask@yahoo.fr

Baydaş, M., & Elma, O. E. (2021). An objectıve criteria proposal for the comparison of MCDM and weighting methods in financial performance measurement: An application in Borsa Istanbul. *Decision Making: Applications in Management and Engineering*, 4(2), 257-279. https://doi.org/10.31181/dmame210402257b.

The choice of an appropriate MCDM and weighting method is often open to decision maker (DM) intervention and can be arbitrary. It is also seen as a cause for concern. Most approaches emphasize the computational workings of methods for overcoming this emotional regret and thus attempt to highlight their abilities and capacities. On the other hand, there is a not-so-innocent situation that seems to support the idea that more than 100 MCDM methods are equivalent to each other: the high similarity (correlation) of MCDM methods, which is comforting for DM. However, each MCDM method proposes its own 'best alternative' and there is no clear consensus between the methods.

There is no completely satisfactory solution in the literature on objective comparison of MCDM methods on results. In this study, 'share price' is proposed as a 'proxy tool' to compare MCDM methods, completely different from the previously proposed approaches for financial performance research. The MCDM analyzes of the study were carried out comprehensively on 131 manufacturing companies in Borsa Istanbul covering a period of 5 years and 20 quarters. The analysis findings point to an interesting, original and reliable solution to the problem of MCDM and weighting method selection. According to the objective comparison results between PROMETHEE, WSA and TOSPSIS methods, PROMETHEE is the most suitable method; According to the results of the comparative analysis between equal, entropy and the hybrid weighting methods we recommend, hybrid weighting has come to the fore as the most appropriate method. The PROMETHEE method produced by far the best performance in 19 of 20 periods compared to its competitors. These results show us that some MCDM methods better capture real life (price). On the other hand, considering the effect of dozens of criteria in the formation of the share price, we evaluate that it can be used as a natural and indirect criterion in the selection of MCDM methods.

Mahmut Baydaş

Necmettin Erbakan University, Faculty of Applied Sciences, Department of Accounting and Finance Management, Turkey

Orhan Emre Elma

Necmettin Erbakan University, Faculty of Applied Sciences, Department of Accounting and Finance Management, Turkey

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Rocha, A., Costa, A. S., Figueira, J. R., Ferreira, D. C., & Marques, R. C. (2021). Quality assessment of the Portuguese public hospitals: A multiple criteria approach. *Omega*, 105, 102505. https://doi.org/10.1016/j.omega.2021.102505.

In Portugal, the National Health Service (Serviço Nacional de Saúde, SNS) aims to provide universal and equal care. Political and economic events that occurred in the last years have had impact on SNS and, as a result, structural reforms and new healthcare policies have been implemented. Though, their focus has been mostly on the improvement of efficiency and reduction of costs, which has been associated to divestment and, consequently, it can increase barriers to the service's quality. In this study, we assess the quality of the Portuguese public hospitals. Due to the multidimensional nature of quality in healthcare, we use various criteria (e.g., patient safety, care appropriateness, and access), and apply a multiple criteria decision aiding method designed for sorting, ELECTRE TRI NC, to build a model in interaction with an expert in the healthcare sector. In this study, each criterion is characterized by a great set of subcriteria, based on indicators from a hospital benchmarking database, and, consequently, we get a complex criteria tree. Thus, we propose an innovative approach using ELECTRE TRI C for the construction of a multidimensional scale for each criterion. Then, we apply ELECTRE TRI NC for assigning the hospitals to five predefined categories. We analyze the hospitals' assignments and perform a robustness analysis of the model. This work's findings may have potential application to healthcare policy and hospital funding in the SNS.

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Ishizaka, A., Lokman, B., Tasiou, M. (2021). A Stochastic Multi-criteria divisive hierarchical clustering algorithm. *Omega*, 103, 102370. https://doi.org/10.1016/j.omega.2020.102370.

This paper introduces a novel hierarchical multi-criteria clustering algorithm based on PROMETHEE, where the number of clusters does not need to be specified. Different from the traditional clustering approaches, the aim is to group the decision alternatives into homogenous clusters in such a way that alternatives belonging to the same cluster are not strongly preferred to each other.

The algorithm, SMAA-MDHC, uses a divisive hierarchical clustering approach where all decision alternatives start in one single cluster and then split recursively. It is built on the preference matrix generated through PROMETHEE for which the output is sensitive to the parameter settings but there is a plethora of situations where the parameters may be unknown (e.g. the choice of a representative DM is infeasible) or uncertain (e.g. the DM is not able to give a precise value). Therefore, in contrast to the existing literature, SMAA-MDHC embeds the Stochastic Multi-objective Acceptability Analysis (SMAA) as well as cluster ensemble methods into the

clustering algorithm. SMAA-MDHC simulates the feasible space of potential combinations in a stochastic environment by randomly varying the PROMETHEE parameters which produce a large number of clustering solutions at the end of the process. To reach a consensus solution, it utilises ensemble clustering, which is a technique combining multiple clusters into a new final clustering solution.

The paper illustrates the performance of SMAA-MDHC on a real-world dataset, where 208 US Banks are partitioned into clusters according to a set of financial and non-financial (Environmental, Social and corporate Governance; ESG) criteria. The results show that SMAA-MDHC yields reasonable and robust solutions across different parameter settings.

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Hubinont, J. P., & De Smet, Y. (2021). Long-term multi-criteria improvement planning. *Decision Support Systems*, 113606. (https://doi.org/10.1016/j.dss.2021.113606)

This paper proposes a novel framework to support the generation of strategies for multi-criteria long-term improvements. It can be applied to general preference models but it is illustrated in this article in the context of Multi-Attribute Value Theory. The novel contributions to the literature are twofold. Firstly, the framework addresses the issue of resistance to change that may arise during the implementation of a given strategy. As such a model is often designed for policy making, it should indeed take into account such considerations. For instance, we constrain a step of improvement to be focused on a single criterion and minimizes the intensity of operational changes. Secondly, it addresses the realism of the improvement scenarios by treating three types of structural dependencies differently: positive synergies, negative synergies and bottlenecks.

The scenarios are generated by finding a set of efficient solutions of a shortest path problem in a graph whose edges represent possible steps of improvement. Each edge is characterized by an increase of rank or level and two penalty functions. The penalty functions are related to the difficulty of execution of the edge. The first one represents a risk associated to bottleneck mechanisms. The second one represents a risk associated to possible operational changes. A case-study using the Shanghai Academic Ranking of World Universities is presented in order to illustrate how this framework could be useful to generate a sequence of strategic actions for the Université libre de Bruxelles.

This paper also introduces the need to answer new questions regarding the recent field of multicriteria benchmarking: should a global preference scale always be correlated to a global difficulty scale (as it is the case in the literature)? How to evaluate the difficulty of a multicriteria improvement?

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Pereira, M. A., Camanho, A. S., Figueira, J. R., & Marques, R. C. (2021). Incorporating preference information in a range directional composite indicator: The case of Portuguese public hospitals. *European Journal of Operational Research*, 294(2), 633-650. https://doi.org/10.1016/j.ejor.2021.01.045

To continuously improve public and private institutions, it is crucial to understand the complexity and multiplicity of systems that deal with big amounts of data. Accordingly, a single measure reflecting that multidimensionality is needed. As aggregators of multiple key performance indicators, composite indicators (CIs) are the solution to this problem. There are several ways to construct such measures, among which data envelopment analysis (DEA) and its numerous CI-generating models. However, desirable and undesirable outputs are a reality in real-world performance assessments, as well as the valuable preference information of decision-making actors. Therefore, it is clear that not all of those DEA models can deal simultaneously with both. For this reason, the popular 'Benefit-of-the-Doubt' (BoD) approach emerges as the solution on which we base our proposal. In essence, we propose an innovative range directional BoD model that not only considers desirable and undesirable outputs, but also includes the preference information and strategic views of the decision-making actors, operationalised via weight restrictions and a directional vector pointing to an artificial target. In the end, we use this CI to assess the performance of the Portuguese public hospitals according to two perspectives of hospital activity: users and providers. After merging these two "sub-CIs", we show that only one hospital was part of both efficient frontiers and substantiate our discussion with statistical analyses before deriving managerial and policy implications in cooperation with the Portuguese Ministry of Health.

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Guerreiro, A. P., Manquinho, V., Figueira, J. R. (2021). Exact hypervolume subset selection through incremental computations. *Computers & Operations Research*, 136. https://doi.org/10.1016/j.cor.2021.105471

The hypervolume indicator is one of the most used quality indicators for assessing the quality of approximation sets in multiobjective optimization. The Hypervolume Subset Selection Problem (HSSP) is the problem of finding a subset of (at most) k points out of a set of n points that maximizes the hypervolume indicator. This problem finds application within the selection step of evolutionary multiobjective optimization algorithms, as well as for selecting a subset of k solutions that maximizes the probability that one of them satisfies a (group of) decision maker(s). The HSSP is known to be NP-hard for 3 and more objectives.

This paper introduces a new Integer Linear Programming (ILP) formulation of the HSSP and provides a proof of the conditions under which solving a partial version of the formulation is sufficient for finding an optimal subset for the HSSP. This paper also proposes a new algorithm based on the ILP formulation, named LayersC, and provides an experimental study where three versions of the algorithm are

compared against the available state-of-the-art for solving the HSSP. The paper shows that the fastest version of LayersC is the one that starts with a greedy solution for the HSSP and then exploits the new ILP formulation of the HSSP by taking advantage, through incremental computations, of the sufficient conditions under which a solution for a partial formulation is also a solution for the HSSP. Such version of the LayersC algorithm is shown to considerably outperform the available state-of-the-art algorithms.

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Web site for the EURO Working Group "Multicriteria Aid for Decisions"

A World Wide Web site for the EURO Working Group on "Multicriteria Aid for Decisions" is already available at the URL:

http://www.cs.put.poznan.pl/ewgmcda/

Web site Editor: Milosz Kadzinski
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This WWW site is aimed not just at making available the most relevant information contained in the Newsletter sections, but it also intends to become an online discussion forum, where

other information and opinion articles could appear in order to create a more lively atmosphere within the group.

Groupe de Travail Européen “Aide Multicritère à la Décision” /
European Working Group on “Multiple Criteria Decision Aiding”

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