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

Groupe de Travail Européen "Aide Multicritère à la Décision"
Série 3, nº35, Fortemps 2018.

European Working Group "Multiple Criteria Decision Aiding"
Series 3, nº 35 Spring2018.

Bernard Roy (1934-2017)
Obituary

Professor Bernard Roy passed away on October 28, 2017. He was a pioneer of Operational Research (OR) in Europe and a world-wide recognized expert in the area of Multiple Criteria Decision Aiding (MCDA). He was a founder of the EURO Working Group on MCDA, and, more generally, a founder of the European School of MCDA. He was also a president of EURO and member of the editorial board of the *European Journal of Operational Research* since its conception 40 years ago.

Bernard Roy has made a very significant and innovative contribution to OR. His major breakthrough works were first in graph theory and project scheduling, and then in multiple criteria decision aiding. Among his many achievements, he is the father of the "activity on node" project scheduling technique and of the famous ELECTRE methods. Through his research, teaching, consulting, and service to the community, he was one of the major promoters of OR techniques in Europe.

Bernard Roy was the founder (1974) and Honorary Director of LAMSADE (since 1999), a research laboratory of CNRS and Paris Dauphine University on "analysis and modelling of systems for decision aiding" (Laboratoire d'Analyse et Modélisation de Systèmes pour l'Aide àla DEcision), and Honorary President of ROADEF (the French association of operational research and decision aiding). He founded in 1975 the EURO Working Group on "Multiple Criteria Decision Aiding" which regularly held two annual meetings since then. He was president of this EURO Working Group during 25 years, and in 2010 he became its Honorary Chairman. He was President Elect and President of EURO in years 1983-1986.

Bernard Roy held a PhD in Mathematics from the University of Paris (1961); he was a graduate of the Statistics Institute of Paris University (1957), and attended courses at Institut d'Etudes Politiques (1954-1956). Before joining the university, from 1957 to 1966, he was a consultant at SEMA (Société d'Economie et de Mathématiques Appliquées), applying Operational Research to real problems. From 1966 to 1972, he was SEMA Scientific Director (METRA International). He joined Paris Dauphine University in 1972 and created LAMSADE in 1974. From 1979 to 2009, he was RATP (the Paris mass transit authority) Scientific Advisor. Bernard Roy was Doctor *Honoris Causa* of seven distinguished universities. He received the "Prix Hermès d'excellence en recherché" from the Faculty of Business Administration, Laval University (Québec, Canada) in 1991, the EURO Gold Medal in 1992, and the MCDM Gold Medal granted by the International MCDM Society in 1995. In 2015, he was also decorated by the EURO Distinguished Service Medal Award. In September 2017, during the 86th meeting of the EURO Working Group on MCDA in Paris, Bernard Roy received the Medal of the Polish Academy of Sciences corresponding to the highest scientific distinction conferred on personalities exterior to the Academy "for merits particularly related to the social role of science".

Bernard Roy was the author of several books and hundreds of research papers. He has been the advisor of numerous graduate and doctoral students. Bernard Roy's main contributions focus on two broad themes:

- Graph Theory with path-breaking contributions to the theory of flows in networks and project scheduling (with the invention of the 'activity-on-nodes' method).
- Multiple Criteria Decision Aiding with the invention of the family of ELECTRE methods and methodological contributions to decision aiding that have led to the creation of the European School of MCDA.

He was active in research until the last days of his life. His recent research addressed robustness in operational research and decision aiding, and multiple criteria tools for collective decision (called "concertation" in French). His personality was non-dissociable from his family, and especially his lovely wife Françoise, with whom he had five children. Françoise passed away in 2015. Their house in Sèvres was particularly warm and friendly to the guests. Meetings at their table covered with dishes prepared by Françoise and wines chosen by Bernard were a feast at once gastronomic and intellectual, refined in simplicity. In his office at LAMSADE, Bernard Roy had two portraits: those of Descartes and Pascal. I would say that they represented a mix of rationality and spirituality peculiar to him.

Despite his overwhelming scientific esteem, Professor Bernard Roy was a modest and considerate person. He radiated enthusiasm and kind encouragement for the young. We will keep a grateful memory of him alive.

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published originally in European Journal of Operational Research 266 (2018) 392–393

https://www.sciencedirect.com/science/article/pii/S0377221717310421

Jean-Marc Martel est né à Québec en 1939. Professeur émérite de la Faculté des sciences de l'administration de l’Université Laval, il y a débuté sa carrière en 1965. Après un *baccalauréat* en mathématiques et une *maîtrise* en statistique, il poursuit ses études à l'Université catholique de Louvain où il obtient son diplôme de doctorat en sciences économiques appliquées en 1975.

Il poursuit une carrière exemplaire et fructueuse consacrée à l'enseignement universitaire et à la recherche scientifique avec un engagement constant dans la gestion universitaire et la promotion de la recherche. Il a occupé plusieurs postes dont celui de vice-doyen à la recherche à la Faculté des sciences de l’administration, professeur invité à l’Université Paris-Dauphine, France et chercheur invité au Centre de recherche conjoint d’Ispra, Italie.

Il a dirigé ou codirigé plus de vingt étudiants au doctorat, et une trentaine à la maîtrise. Il a ainsi contribué à la formation d’une génération de chercheurs en aide multicritère à la décision, domaine dans lequel il s’est illustré en tant que chercheur prolifique et passionné. Il y compte plus de 300 publications, conférences et communications. Par son travail, son engagement et son dévouement, Jean-Marc Martel a propulsé la discipline de l’aide multicritère à la décision au Québec et contribué à son essor dans le monde. Il s’est distingué par une application rigoureuse de ses techniques particulièrement en finance, psychologie, environnement ou encore dans le domaine militaire. Il est le récipiendaire de plusieurs bourses de recherche du Conseil de recherches en Sciences Naturelles et en Génie (CRSNG, Gouvernement du Canada) et du FCAR (Gouvernement du Québec).

De plus, à titre de responsable ou de membre de comités organisateurs ou scientifiques, il a participé à l'organisation d'une vingtaine de conférences et de séminaires, dont la Quatrième école d'été internationale en aide multicritère à la décision à Québec en 1991, les Troisièmes journées francophones de la recherche opérationnelle à Québec en 2001 et les 48es Journées du groupe de travail européen sur l'aide multicritère à la décision en 1998. C’est ainsi que pour la première fois de son histoire, ce groupe de travail acceptait de se réunir hors de l'Europe.

La Faculté des sciences de l'administration de l’Université Laval a reconnu la qualité du travail de Jean-Marc Martel en lui décernant, en 1989, le prix Hermès pour l'excellence en recherche, la médaille Alfred-Houle en 1991 pour son engagement dans le programme de doctorat et le prix Hermès pour l'excellence en enseignement en 1997.

Tous ceux qui ont côtoyé Jean-Marc Martel gardent le souvenir d’un chercheur passionné, créatif et exigeant, celui d’un homme droit, intègre, respectueux et d’une grande humanité.

Jean-Marc Martel was born in Quebec City in 1939. In 1965, he began his career as a professor in the Faculty of Administration Sciences at Laval University, where he obtained a bachelor's degree in mathematics and a master's degree in statistics. Fellow of the Belgian government, he continued his studies at the Catholic University of Louvain where he obtained his doctoral degree in Applied Economics in 1975.

He pursues an exemplary and successful career dedicated to teaching and research with a constant commitment to university management and the promotion of research. He has held a number of academic positions, including that of Visiting Professor at the Université Paris-Dauphine, France and as Invited Researcher at the Joint Research Center at Ispra, Italy. For many years, his research has been supported by the National Science and Engineering Research Council (NSERC, Government of Canada) and the FCAR (Government of Québec).

He has supervised or co-supervised more than 20 doctoral students, and about 30 at the master's level. He has thus contributed to the training of a generation of multicriteria decision-making researchers, a field in which he has distinguished himself as a prolific and passionate researcher. There are more than 300 publications, conferences and communications. Through his work, his commitment and his dedication, Jean-Marc Martel has propelled the discipline of multicriteria decision aiding in Quebec and contributed to its growth in the world. He distinguished himself by a rigorous application of MCDA techniques particularly in finance, psychology, environment or even in the military field. In addition, he has participated in the organization of some 20 conferences and seminars, including the Fourth International Summer School for multi-criteria decision making in Quebec City in 1991, the Third Francophone Days of Operational Research in Quebec City in 2001 and the 48th Days of the European Working Group on Multicriteria Decision Aiding in 1998. For the first time in its history, the group agreed to meet outside Europe. Université Laval's Faculty of Business Administration recognized the quality of Jean-Marc Martel's work by conferring on him, in 1989, the Hermès Award for Excellence in Research, the Alfred-Houle Medal in 1991 for his commitment to the doctoral program and the Hermes Award for Teaching Excellence in 1997.

All those who have worked with Jean-Marc Martel keep the memory of a passionate, creative and rigorous researcher, that of an upright person, honest, respectful and of great humanity.

Opinion Makers Section

An Informal Overview of Behavioral Biases in Decision Making

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The biases in human judgment have been studied extensively. The work of several researchers in this area have been recognized by the Nobel Memorial Prize in Economics: Herbert Simon in 1978, Daniel Kahneman in 2002, and Richard Thaler in 2017. The area is fascinating. There have been many publications in scholarly journals and several books targeted towards the general public are also available.

In this article, I will present an informal overview of various aspects of the subject and provide some references for interested readers. I will write in an essay format and keep away from formal terminology for brevity, as the purpose of this article is to provide a general understanding of the topic.

The work of Daniel Kahneman and others categorize human thinking into System 1 (intuitive) and System 2 (analytic). A vast majority of our judgments and decisions are considered to result from the intuitive nature, which is fast, effortless, and emotional. While intuitive judgements are useful and convenient, they lead to systematic biases and undesirable outcomes from time to time. Interestingly, intuitive judgments are not easy to abandon and avoiding biases is not straightforward. Analytic thinking has to be conscious and requires cognitive effort. It is typically reserved for decisions that have important consequences.

Visual illusions are examples of how our intuitions may fail us. A typical case is shown in Figure 1, where we see the famous arch of St Louis. When we compare the height and width of the arch, most, if not all of us see that it is (much) taller than it is wide. This is, in fact, an illusion and the height of the arch is identical to its width. The fact that our vision, which is supposed to be one of our strengths, can be deceived in such an easy task has been shown as an alarming example on how much we can fail in cognitive issues.

In his 1955 paper, which has been cited about 15,000 times (as of April 2018 based on Google Scholar citation counts), Herbert Simon introduced the term "limited" rationality in contrast to the "rationality" assumed in economic theory which requires possessing all the available information and the capability to process all information in order to come up with the "optimal" course of action. Herbert Simon points out that this is an impossible task. He later introduced the term "bounded" rationality and argued that humans, rather than keep seeking for the best outcome, make their choices once they find satisfactory courses of action. He also argued that people would relax their definitions of "satisfactory" depending on the difficulty in reaching such actions. Based on this observation, he introduced the term "satisficing", combining the words "satisfy" and "suffice." Simon's observations and inferences are quite convincing. Many of us use implicit "heuristics"- mental shortcuts that help us make quick decisions. These heuristics usually serve us well, but, under some predictable circumstances, may lead to systematic biases. Furthermore, it is possible to create some of these circumstances artificially by narrating ("framing") stories in certain ways.

In this informal article, I will briefly talk about heuristics, biases, and the framing effects of stories.

Figure 1. St Louis Arch
By Bev Sykes from Davis, CA, USA (Flickr)
[CC BY 2.0 (https://creativecommons.org/licenses/by/2.0)]

Heuristics and Biases

The heading of this section is part of the title of the legendary paper by Kahneman and Tversky (1974) that has been cited over 45,000 times (as of April 2018 based on Google Scholar citation counts).

There are a number of well-known heuristics that explain how people make judgments under certain circumstances. We will briefly cover some of these and talk about the potential biases they may lead to below.

Availability heuristic

The availability of information in our memories on certain subjects may affect the way we judge those subjects. However, the availability of information is usually subjective and very much open to manipulations. People tend to judge the importance of issues based on the ease with which they retrieve related information from their memories. Naturally, the extent of media coverage is closely related with the availability of issues in our memories. It is then no wonder that politicians desire to

control or manipulate the media. The ease with which politicians can manipulate our biases through the media is a key reason why there are many laws and constitutional rights protecting independent media and free speech in democratic countries, just as we see tight control on media in some countries where democratic rules and traditions are less established.
Quite often marketing campaigns also try to exploit the effects of this heuristic on consumers. After all, the more you hear about a brand, the more likely its name will pop up the next time you shop, which will increase the chances you will purchase its products provided you had not developed strong negative opinions.

In an experiment demonstrating the availability heuristic two groups of subjects were asked about their assertive behavior in the past. Subjects in one group were asked to list a few instances of their assertive behavior, while those in the other group were asked to recall a greater number of such instances. After submitting their responses, they were asked to comment on their assertiveness. The members of the group that was asked to list fewer instances had little trouble coming up with the required number of instances during which they were assertive. The members of the group needing to come up with a greater number of such instances generally struggled to think of the required number of examples and as a result rated themselves as less assertive than did the members of the first group. It is interesting to observe that even one's self-assessment can be affected by the number of instances one has to recall from memory.

Based on this observation, I recommend that you do not ask your loved ones to come up with reasons why they love you! If you cannot resist the temptation, ask for only one reason, and never ask for too many; you would not want them to wonder why they cannot come up with enough reasons. After covering this subject in class, I tell my students that I will ask them to list 20 reasons to improve my course just before course evaluations!

There have been extensive tests with subjects showing that people display systematic, predictable bias in a variety of ways using the availability heuristic. Readers who are interested in further details can refer to scholarly papers as well as popular books, some of which are listed at the end of this article.

Representativeness heuristic

We sometimes assess the likelihoods of events based on the occurrences of similar events in the past. This approach is referred to as the representativeness heuristic. Again, this works quite well in many instances but leads to systematic and predictable biases under certain circumstances. Specifically, we tend to overlook probabilistic facts while jumping to conclusions based on similarities. Our biases can lead us to ignore base rates or sample sizes, forget about the concept of regression to the mean, fall into conjunction fallacies, or have other misconceptions of chance events. I will briefly talk about and give examples for some of these cases.

Insensitivity to base rates

Many experiments demonstrated that people generally disregard base rates (underlying population sizes) of the events under consideration. It is quite common to associate tall people with basketball. However, although the percentage of tall basketball players is quite high, there are many more tall people who are not basketball players. When we see a random tall person, therefore, the probability that he or she is not a basketball player is higher, yet we still wonder if a really tall person we see is a basketball player. We usually ignore base rates or consider irrelevant populations when judging the likelihoods of occurrences. Our estimations of posterior probabilities are likely to be off by large margins, especially when rare events are involved. There are many serious implications of these misconceptions in health-related estimations and legal matters.

Given that the result of a medical test is positive, we tend to hugely overestimate the likelihood of the corresponding medical condition if this is a rarely-encountered condition. Let us consider a rare disease that is seen in 1 person among a population of 1000. A test correctly diagnoses the disease 98% of the time and gives a false positive only 1% of the time. Sounds like a good test even for people who have strong probability background. We tend to estimate that the probability of someone who is diagnosed positive by the test to actually have the disease would be quite high. Calculating the likelihood, however, reveals that a person who is diagnosed by the test to have the disease has only about a 9% chance to actually be afflicted. After discussing such examples in class, I tell my students that I just came up with a "better" test that would diagnose the disease in 100% of the cases. I explain that my test diagnoses everyone positive, never missing the correct diagnosis of anyone who indeed has the disease!

Insensitivity to the Sample Size

Another aspect we usually ignore when making intuitive judgments is the sample size. It is well-known that variation is expected to be larger in smaller samples. However, even those of us who know this fact well may overlook it when relying on our intuitions.

Wainer and Zwerling (2006) provide an interesting example to demonstrate this case. They observe that the counties of the US where the lowest rates of kidney cancer is seen among men are those that are rural, located in the Midwest, the South, and the West. They argue that it is tempting to associate this result with the clean and healthy living conditions in rural areas. However, the counties that have the highest rates of kidney cancer have identical characteristics. They argue that it would be tempting to ascribe this to factors such as poverty, high-fat diets, and limited access to healthcare, in the latter case. It is

interesting how we are inclined to make inferences on cause-effect relationships. In this case, however, the explanation is the sparse population of these rural areas. Since the populations (sample sizes) are small in these counties, whether there is one more or less incidence makes a big impact on the statistics. Therefore, the variation is high in such counties and we obtain both extremes in counties having identical characteristics. Although it may be hard for us to accept, having the lowest or highest incidences, in this case, are just random occurrences.

Regression to the Mean

Many of us are aware of the fact that extreme events are rare and we should not expect them to occur one after another. We would expect to observe more observations close to the mean than far from it. Kahneman (2011), at the introduction of his book, describes his experience with flight trainers. The flight trainers argued that praising a pilot after an exceptionally smooth landing results in a poor landing by the same pilot the next time, whereas harsh criticism after a rough landing by a pilot results in an improvement by the same pilot in the next attempt. However, the truth is that these incidences are expected outcomes of regression to the mean. Both exceptionally smooth and rough landings are rare events and are unlikely to be repeated during the next landing. Regardless of the response by flight trainers, we would expect the following landing to be closer to the mean performance of the pilot (i.e., regression to the mean). Elegantly summarizing the phenomenon, Kahneman states, "We are statistically punished for rewarding others and rewarded for punishing them."

Conjunction Fallacy

Adding details can make stories more believable. People commonly enrich their stories by including interesting – and sometimes fictitious – details. Perhaps, the readiness of people to accept stories that suit their beliefs with little or no evidence explains, in part, the abundance of conspiracy theories.

It follows common sense that the conjunction of two events is less probable than either event happening by itself. However, when the occurrence of the second event makes the first one richer, many people could overlook the general principle and think that the conjunction of events is more probable. Tversky and Kahneman (1983) conducted many experiments demonstrating this phenomenon. One of the experiments presented the following two scenarios to two separate groups of students:

1. *A massive flood somewhere in North America in 1983, in which more than 1000 people drown.*
2. *An earthquake in California sometime in 1983, causing a flood in which more than 1000 people drown.*

The group that evaluated the second scenario assigned a significantly higher probability to this scenario than the group that evaluated the first scenario. Naturally, the first scenario is more likely as it is contained in the second scenario. However, when the scenario is made richer by coupling it with an event that can be associated with California, it becomes more believable to many people.

Confirmation heuristic

This heuristic refers to prior beliefs or intuitions and the fact that people often look for confirming rather than refuting evidence for these convictions. Naturally, relying on this heuristic may lead to making poor decisions by overlooking the weaker aspects of the choices we are inclined towards.

There are a number of biases caused by this heuristic. I will briefly mention two of them.

Overconfidence is one of these biases and it has several forms. It can have many negative consequences including leading to conflicts and even wars, making poor business decisions, vastly underestimating costs and durations of projects, and so on. Several years ago, when on a city tour of Hamburg, Germany, I saw the beautiful unfinished concert venue, Elbphilharmonie. I read about the project and found out that the construction started in 2007 with an estimated completion time of 2010 and an estimated cost of 77 million Euros. The building was eventually completed and opened on January 1, 2017 with a total cost of 789 million Euros!

Svenson (1981) conducted an experiment with students from Sweden (having a median age of 33) and students from the United States (having a median age of 22), all of whom had driver's licenses. 69% of the students from Sweden and 93% of the students from the United States considered themselves more skillful than the median driver!

Anchoring is another bias associated with the confirmation heuristic. It indicates that once we are exposed to a reference value, we are unlikely to deviate much from that value in our estimations. For example, many people are influenced by the original price of an item on sale. The bigger the reduction looks, the more attractive the item is. I often wonder whether some products are ever sold at their 'original' prices. Interestingly, anchoring bias can even influence experts in their own areas of expertise.

Another example on anchoring is the effect of the highest-priced item in a restaurant's menu. Although many diners may not buy the highest-priced entrée, the mere addition of a more expensive item to the menu may make the previously highest-priced (now second highest-priced) dish suddenly look more attractive.

Kahneman and Tversky (1974) describe an experiment in which a biased wheel of fortune was spinned in front of subjects and the wheel would stop either at 10 (low

anchor) or 65 (high anchor). The subjects were then asked whether the percentage of African nations in the United Nations was larger or smaller than the number that came up. After responding, they were asked to come up with their own estimates of the percentage of African nations in the United Nations. The median estimate given by those after seeing the low and high anchors on the wheel were 25%, and 45%, respectively. Even though they thought the wheel just returned a random number, the subjects were not able to deviate much from that irrelevant anchor! Many other experiments have been conducted showing the anchoring bias in different contexts, including one where people purchase more of a sale item when an upper limit on the number of units that can be purchased is imposed than when there is no limit.

Framing

Kahneman and Tversky (1979) observed that people's risk attitudes are dependent on whether gains or losses are involved. Based on many experiments, they found out that people are more often risk averse when gains are involved, but risk seeking when losses are involved. That is, people settle for less than the expected value when a risky decision with positive payoffs is involved. However, when the payoffs are negative, people tend to risk more to take their chances with the hope that they would avoid the losses totally. To represent this type of behavior, Kahneman and Tversky (1979) developed their famous *Prospect Theory* which has been cited about 50,000 times (as of April 2018 based on Google Scholar citation counts).

An interesting aspect is that the definitions of gains and losses might be ambiguous at times. In other words, the same situation can be described as a gain (e.g., number of lives saved from a certain population) or a loss (e.g., number of lives lost from the same population). In such cases, people's risk attitudes towards the same problem can differ depending on how the situation is presented (framed).

There is extensive literature and evidence showing the effects of framing. I will briefly cover this subject and present several examples.

Default Effect

It has been shown that the default option has an important impact on our choices. Johnson and Goldstein (2003) looked at the effect of the default option on organ donations in European countries. The effect was immense. In the four opt-in countries (Denmark, Netherlands, United Kingdom, and Germany) the consent for donations were 4 to 27%, whereas in six of the seven opt-out countries (Austria, Belgium, France, Hungary, Poland, and Portugal), the consents were almost 100% and in one country (Sweden) it was 86%. In this special case, the framing effect is a great success in terms of saving lives in the opt-out countries.

Endowment Effect

The endowment effect refers to people's tendency to attach a high value to objects in their possessions. It is also referred to as the status quo bias and stems from the loss aversion inclination. Thaler (1980) discusses the subject with many interesting examples. One of the examples he gives may be hard to relate to for younger generations who have not lived during periods when there was no digital photography. Back when film photography was prevalent, some photo printing companies would print every photo on their customers' film rolls and allow customers to return the photos they did not want. Apparently, the endowment effect prevented customers from returning most of the prints.

In our context, the word "endowment" can in fact be interpreted rather loosely. The goods may not even need to belong to you in order for you to be influenced by the endowment effect. In an experiment we conducted, we kept presenting three sets of item collections (such as magazines, movie tickets, coffee beans, snacks, etc.) for subjects to choose between (with sizeable incentives to be truthful in making their choices). In each step, we kept the collection the subject chose in the previous step and added two new random collections. We found that subjects were willing to trade the collections they selected in earlier steps for newer ones at a significantly lower rate than we would expect, had the subjects' preferences been independent of the order the collections were presented (Ravaja et al. 2016).

The Endowment effect also has implications for Multiple Criteria Decision Making literature regarding whether the solution processes of interactive algorithms affect the final solutions reached. Several researchers have addressed this issue, and there have been discussions on whether it would be beneficial to start with dominated points and progress with improving all objectives simultaneously. While there is merit in the argument that the endowment effect could play a role between tradeoff questions, there is no evidence that improving all objectives simultaneously would be a less biased way of collecting preference information on decision makers' preferences.

Examples of the endowment effect can be seen everywhere. Some furniture stores send furniture to homes free of charge and with free returns, probably with the hope that you are more likely to keep the furniture once you see it in your home and the endowment effect kicks in. Another company regularly sends its customers clothing they have not chosen or even seen. The company's stylists choose several pieces of clothing based on each customer's taste. The customer then tries the items on at home and only pays for those he/she decides to keep, returning the rest free of charge. The fact that the company makes a profit in spite of all the shipping costs could perhaps be partially attributed to the endowment effect.

Conclusions

In this article, I attempted to present a brief introduction to several types of flaws we display in our reasoning while making choices. This is a fascinating topic that has been studied extensively, and the research shows that there are many factors affecting our choices and we are vulnerable to manipulation. My motivation in providing this overview was to invoke the curiosity of researchers working in the field of multiple objective decision making.

I would like to mention a center that looked at the issues we have been discussing from a slightly different perspective. The Center for Adaptive Behavior and Cognition (the ABC group at the Max Planc Institute for Human Development) aimed at developing simple heuristics for decision making with interdisciplinary teams of scientists under the leadership of Gerd Gigerenzer from 1997 to 2007. Group members authored many publications.

As an example, the book edited by Gigerenzer, Todd, and the ABC Research Group (1999) looks at issues from the perspective of developing simple heuristics to help decision making while avoiding some of the biases that themselves stem from heuristics.

For those who would like to learn more, I recommend Daniel Kahneman's (2011) book which targets general readers with no background in the area. It is very well written and easy to read. Another source that is fun to read is Dan Ariely's (2009) book. Mladinow's (2008) book deals with our misconceptions in chance events and also targets the general public as its audience.

For those who intend to teach introductory courses in this area, several text books such as Bazerman and Moore's (2013) and Hardman's (2009) are also available.

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MCDA Research Groups

Decision aiding in IMT Atlantique

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The researchers contributing to the decision aiding group are all members of the DECIDE research team of the Lab-STICC[1] mixed research unit, and are based in the LUSSI department of the IMT Atlantique[2] technical university. The DECIDE team intends to provide decision support solutions for decision makers facing heterogeneous and complex data (e.g., text, signals, images, sensors, streams, social networks, interactions, decision making contexts, preferences, spatial data,…). To support the decision making action, DECIDE's ambition is to provide the decision makers with tools allowing them to:

- Identify, model, and understand the information extracted from data,
- Make reliable and robust decisions based on the extracted information,
- Justify the decision recommendations to demonstrate their quality,
- Provide coherent recommendations according to the decision makers' needs,
- Model the different stages of the decision support process to guarantee that recommendations are both readable and traceable,
- Reach a compromise whenever decision makers have conflicting preferences.

To tackle these scientific challenges, the DECIDE team works along four research axes: decision aiding, data mining, information integration and quality, engineering for decision support.

The group of researchers of IMT Atlantique contributing to the decision aiding axis is currently composed of one professor, two associate professors, three PhD students and three research engineers. Their contributions are in the fields of:

- Multi-Criteria Decision Aiding and preference modeling (outranking and value-based techniques),
- Multi-objective optimization (with integration of the decision makers' preferences),
- Shortest path algorithms (stochastic aspects and speed-up techniques) and vehicle routing problems.

Beyond specific contributions to these different fields, another objective of the group of researchers is to develop algorithms and tools that address challenges at the interfaces of these topics. They also take advantage of the DECIDE team's multi-disciplinary structure to integrate data mining, machine learning and information fusion concepts into decision support techniques.

Besides, the decision aiding group contributes to many collaborative research programs and industrial projects. In this context, the developed algorithms are implemented in perennial and widely distributed platforms, as the **diviz**[3] decision aiding ecosystem of the Decision Deck Consortium or the **MCDA package**[4] for the R statistical system. The diviz ecosystem is a workbench to design, execute and share complex MCDA algorithms and experiments. It currently proposes to access about 200 different algorithmic components, which can be used to recreate classical MCDA methods like, e.g., the Electre or Promethee families, Choquet integral based aggregation, UTA-like disaggregation, etc.

Another specificity of the group is to propose algorithms and software tools that combine decision aiding techniques with spatial data in real-world contexts. Recently, they have developed a collaborative platform called **deSEAsion**[5] which supports maritime decision making.

Use cases of the platform are maritime spatial planning, impact assessment on ecological ecosystems, locating maritime renewable energies, controlled ship stranding, economic development of maritime areas or the coast, evaluation of public policies,...

The deSEAsion platform proposes to use different models, which allow evaluating qualitatively or quantitatively the geographical zones involved in the decision problem, using multiple criteria and the preferences of the decision makers. The tool also allows generating areas for human activities at sea which respect certain constraints expressed by the decision makers. All this is done by ensuring a high level of readability of the outputs, as well as a good traceability of the decision aiding process. Ultimately the platform will be able to help the various stakeholders in the negotiation process linked to the decision problem.

Its key features are therefore:

- Hierarchical structuring of the decision problem,
- Modeling of the multiple objectives involved in the decision,
- Integration of the perspectives of the multiple stakeholders,
- Distant or local collaboration around a unique tool.

[1] https://www.labsticc.fr/
[2] http://www.imt-atlantique.fr/
[3] https://www.diviz.org
[4] https://cran.r-project.org/package=MCDA
[5] http://recherche.imt-atlantique.fr/deseasion/

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Forum Section

Bipolar robustness control in UTA methods

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1. Introduction

The philosophy of preference disaggregation in multicriteria analysis is to assess/infer preference models from given preferential structures and to address decision-aiding activities through operational models within the aforementioned framework. In simple words, assuming that a decision is given, the preference disaggregation approach is focused on finding rational basis for the decision being made. Therefore, it is possible to assess the Decision-Maker's (DM's) preference model leading to exactly the same decision as the actual one (Siskos et al., 2016).

Preference disaggregation has been proven especially competent for complex decision making systems, in the presence of multiple conflicting and heterogeneous criteria (Jacquet-Lagrèze and Siskos, 2001; Siskos et al., 2016). In such cases, the standard explicit elicitation of preferential parameters, especially when the DMs are ignorant of the rationale and methods of Multiple Criteria Decision Aid (MCDA), is a complicated task, which poses a heavy cognitive burden, and often leads to results of questionable value and acceptance. These decision making systems can be alternatively addressed with the aid of the implicit procedures of preference disaggregation (Siskos and Grigoroudis, 2010; Stavrou et al. 2016).

Consequently, the acquisition of a weak-order preference structure on a set of actions A_R by the DM, requires that the additive value or utility functions are adjusted based on multiple criteria, in such a way that the resulting structure would be as consistent as possible with the initial structure. This principle underlies the disaggregation approach, where the preference models are inferred given a set of global preference, contrary to the traditional aggregation paradigm, where the criteria aggregation

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model is known a priori, while the global preference is unknown.

A combination of the previous options may also be applicable (i.e., A_R may include a subset of *A*, as well as a set of fictitious actions). In this procedure the DM is asked to externalize and/or confirm his/her global preferences on the set A_R, taking into account the performances of the reference actions on all criteria. The resulting DM's aggregated value system is then applied to A, thus the main aim of such an approach is to aid the DM to improve his/her knowledge on the decision situation and his/her way of preferring, which entails a consistent decision to be achieved.

2. Interactive Disaggregation and Robustness Control

The UTASTAR inference engine shows that the DM's preference model may not be a unique additive value function but a set of functions, all being compatible with the holistic preference statements provided to the analyst. This infinite set of functions comprises a polyhedral set, confined under some linear constraints, in the $\sum_{i=1}^{n}(\alpha_i - 1)$ dimension space, where a_i is the number of points on which the value function u_i is assessed.

Recently Siskos and Psarras (2016) proposed an interactive bipolar robustness control, which manages robustness in both phases/poles of the interactive decision support process, namely the disaggregation and the aggregation one. Through this integrated procedure, the analyst has the possibility to examine, measure and analyze, in a systematic way, the robustness of the decision model's parameters and the results that emerge after the implementation of the additive value model. Although bipolar robustness control is coupled perfectly to the UTA-type methods, it can be just as well implemented in synergy with several other MCDA methods.

Regarding the family of UTA methods, the robustness control process is initiated after the inference of the additive value model, which leads to the ranking of the reference actions. It then proceeds to the analysis of the robustness of the model, with the option of discontinuing the modeling process, if the results are not satisfactory. In this case, the analyst asks the DM to enrich the reference set with additional reference actions or add other new preference statements. In the reverse direction, the process moves from the disaggregation to the aggregation pole, where the MCDA model is implemented and the ranking of the real actions is achieved. Robustness is again measured in this pole, in terms of the stability of the ranking positions of each action. If the robustness of the results is adequate enough to support a sound decision, the algorithm ends, otherwise the analyst returns to the disaggregation pole and asks the DM for the acquisition of additional preferential information.

The robustness control framework, when coupled with any UTA family method, uses two separate sets of robustness indices to judge: (i) the efficacy of the additive model in the disaggregation pole and (ii) the robustness of the final results, achieved after the extrapolation of the model on the whole set A, in the aggregation pole.

The indices, related to the disaggregation pole of the robustness control framework, such as ARP and ASI, focus on the efficacy/stability of the model to produce results that are stable and not misleading or ambiguous. The objective of these indices is to build a robust decision model that accurately reflects the preferences of the DM. On top of that, these indices have a practical meaning, since they prevent the analyst from performing heavy, pointless computations, which are certain to reach results of low quality. The mathematical framework of the robustness indices, applied in this work, can be found in Matsatsinis et al. (2018).

3. An Application Example

3.1. Problem presentation

The example presented in this section is inspired from a successful real world application of the UTA method in a job evaluation problem in a leading Greek organization (Spyridakos et al., 2001). In the organization under examination, job evaluation concerns the assessment of a value system that encapsulates the importance of the parameters that reflect the global responsibility and duties of each different job position. Three evaluation criteria are presented in Table 1. Using the aforementioned criteria, 10 job positions are evaluated, as shown in Table 2.

Table 1: Job evaluation criteria for the application example

Criteria name	Point of view	Type	Evaluation scale
g_1: Required qualifications and skills	Input	Measurable	Numerical scale [5, 20]
g_2: Contribution to decision making	Process	Ordinal	[limited, medium, high, very high]
g_3: Responsibility	Output	Ordinal	[limited, medium, high, very high]

Table 2: Multicriteria evaluation of 10 job positions

Job position	Criterion 1 (Required qualifications and skills)	Criterion 2 (Contribution to decision making)	Criterion 3 (Responsibility)
A	7	medium	high
B	12	high	medium
C	15	limited	limited
D	5	medium	medium
E	10	limited	very high
F	19	very high	limited
G	12	limited	high
H	8	high	high

I	16	limited	medium
J	6	medium	very high

3.2. Reference set and preference elicitation

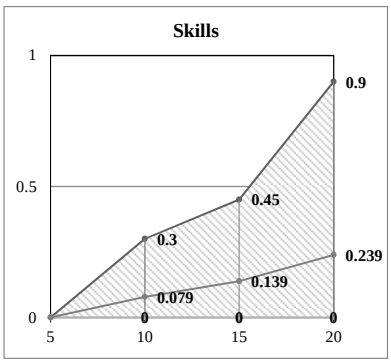
The decision analyst develops a dialogue with the DM in order to construct a reference set of job positions and help the DM to articulate his preference statements.
Consequently, the constructed reference set of reference jobs includes one real job position from the set A and three fictitious job positions, i.e., $A_R = \{Z_1, E, Z_2, Z_3\}$ as presented in Table 3.

Table 3: DM's ranking of the four reference job positions

Reference job position	Criterion 1 (Required qualifications and skills)	Criterion 2 (Contribution to decision making)	Criterion 3 (Responsibility)	Ranking position
Z_1	5	high	very high	1
E	10	limited	very high	2
Z_2	10	high	high	2
Z_3	15	medium	medium	4

3.3. Bipolar robustness control

The implementation of the UTASTAR procedure reveals results of significantly low quality with regard to their robustness; no decision on the ranking of the ten job positions can therefore be supported at this current stage of the analysis.
Specifically, the *ASI* index takes the value of 0.733, while the average range of the preferential parameters (*ARP*) is 0.686 (i.e., equals to 68.6% of their whole possible ranging area). In particular, certain parameters, such as w_{13}, w_{23}, and w_{31} can range from 0 to 0.9, being in essence uncontrollable (see Figure 1). Consequently, the bipolar robustness control procedure does not allow moving to the aggregation pole (2nd pole of robustness control).



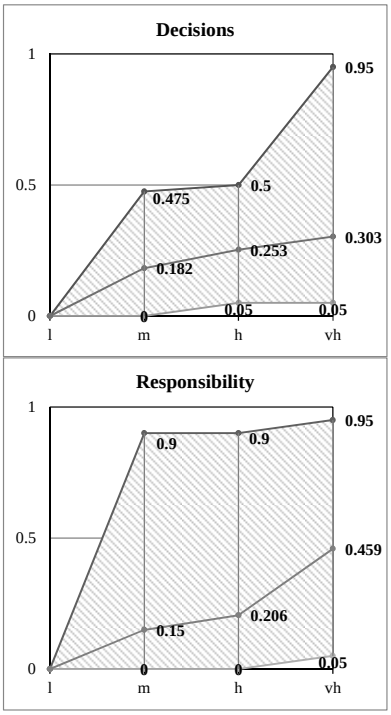


Figure 1: Visualization of the variation of the 3 additive value functions (maximum, barycenter and minimum) from the application of the bipolar control iterations (1st iteration)

UTASTAR re-activation (5 additional iterations)

The analyst decides to ask for new preference statements from the DM, with a view to ameliorating the robustness of the results. In this procedure, care should be taken in order to ensure that the newly added preference information is consistent with the old preferential statements. In total, the request for feedback by the DM was implemented 5 consecutive times, in which the analyst either provided the DM with additional reference job positions to add to the ranking, or asked him to provide values to certain fictitious job positions, in order to consider them as equal. Figure 2 visualizes the variation of the 3 additive value functions, as analyzed during the last 5 iterations of the robustness control procedure, and showcases the significant increase in the robustness of the results

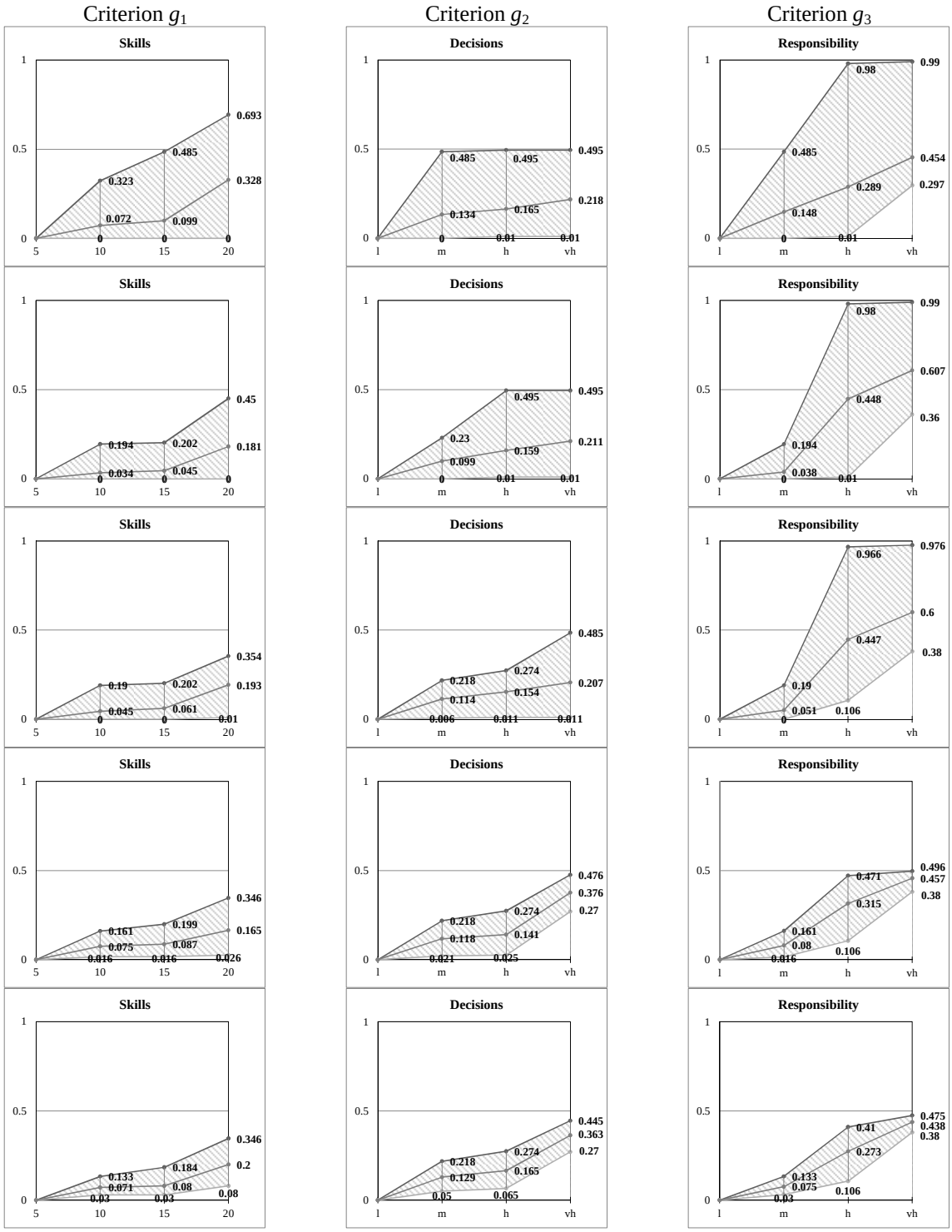


Figure 2: Visualization of the variation of the 3 additive value functions from the application of the bipolar control procedure (2nd to 6th iteration)

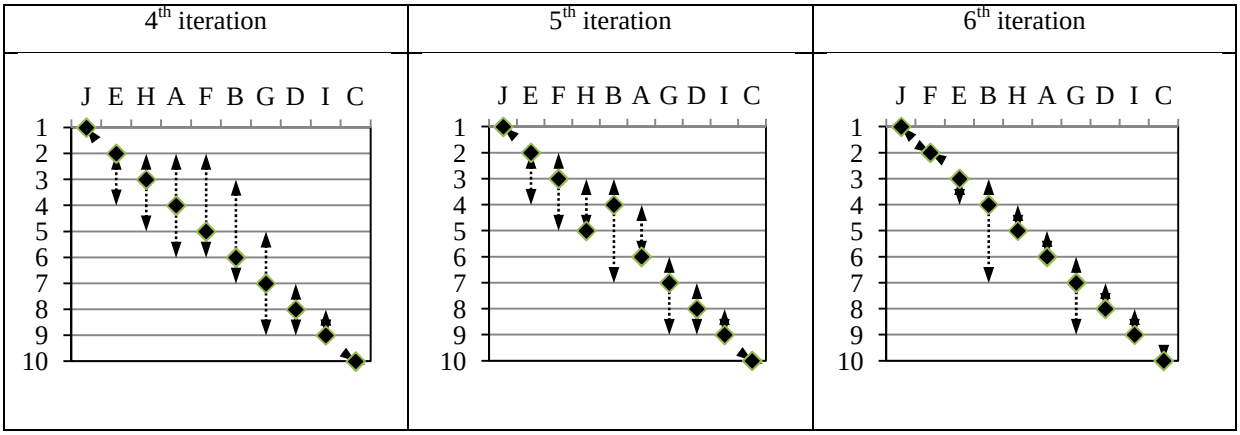


Figure 3: Results of the Extreme Ranking Analysis in the 4th, 5th and 6th iteration of the robustness control procedure

During the last three iterations, the robustness indices allowed the transition to the aggregation pole, and therefore the Extreme Ranking Analysis (ERA) (Kadziński et al. 2012) was implemented, in order to examine the robustness of the obtained results.

The extrapolation to the 10 real job positions with the aid of the ERA, during the last three iterations of the robustness control procedure, is depicted in Figure 3. These graphs present the ranking of the 10 real jobs in descending order (diamond dots), as well as the best and worst possible ranking position of each job, with the use of the two sided arrows.

After the visualization of the ERA in the 6th iteration the DM endorses the adequacy of the results and decides to keep the final ranking as definitive. The decision support procedure, coupled with the bipolar robustness framework, ends at this stage. Table 4 depicts the evolution of the robustness indices, throughout the 6 iterations, along with their improvement (in percentage), after each consecutive iteration.

Table 4: Evolution of the robustness indices after each iteration (percentage improvement in parentheses)

Iteration	*ARP*	*ASI*	*ARRI*	*RARR*
1	0.686	0.733	-	-
2	0.567	0.772		-
	(17.3%)	(5.3%)	-	
3	0.427	0.795		-
	(24.8%)	(3.0%)	-	
4	0.370	0.808	3.4	26.7%
	(13.3%)	(1.6%)		
5	0.214	0.898	2.9	21.1%
	(42.2%)	(11.1%)	(14.7%)	(21.0%)
6	0.175	0.909	2.2	13.3%
	(18.1%)	(1.2%)	(24.1%)	(37.0%)

4. Conclusions

The interactive aggregation-disaggregation approach presented in this work aims to infer robust preference models using preferential structures, provided by the DM, and assessing them using a robustness control methodology. In particular, the proposed approach may be considered as a new outlook on the UTA-family methods, devoted to the elicitation of values through the inference of multiple additive value models.

In the context of robustness analysis, several robustness indicators are used, while the proposed bipolar robustness control procedure is able to take into account the different perspectives of robustness: Analyst's point of view during the 1st pole (disaggregation) that examines if a decision model is reliable; DM's point of view during the 2nd pole (aggregation) that examines if the results of a decision model are acceptable.

Based on the above, the interaction between the analyst and the DM is necessary during any robustness control procedure in UTA methods. This interaction procedure may include: a) The consistency between the assessed preference model and the a priori preferences of the DM; b) The assessed values (e.g., values, weights, utilities); c) The overall evaluation of potential actions (extrapolation output).

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About the 87th Meeting of the EWG/MCDA

Delft University of Technology was honoured to be hosting one of the prominent events of Multicriteria Decision Aiding in Europe, the 87th Meeting of the EWG/MCDA. This meeting was held on April 5th-7th, 2018, in the Faculty of Technology, Policy and Management, Delft University of Technology, the Netherlands. The main theme of this meeting was socio-technical systems. Scholars and practitioners were invited to contribute papers to discuss theoretical, methodological, and application studies dealing with multicriteria decision aiding, and in particular those related to the theme of the meeting.

The level of interest in this spring meeting was outstanding. We received around 50 submissions with many authors showed interests to present their research: 18 papers were selected for presentation and 26 were included in the program as papers submitted to discussion. More than 70 researchers from 15 countries attended and actively contributed to the meeting.

Day 1 started on midday with a light lunch where participants greeted each other. Jafar Rezaei opened the meeting and welcomed the participants to the historic town of Delft, known to be home to the largest and oldest Dutch technical university. The day proceeded two sessions of presentations, each chaired by Roman Słowiński and Lisa Scholten.

The day concluded with a banquet at the historical setting of Eetcafe De Waag, one of the top ranked restaurants in Delft according to Tripadvisor. Via the spiral staircase at the entrance, the participants entered the restaurant. Overlooking the Markt and other beautiful parts of Delft, the participants could enjoy the action in the open kitchen and the atmosphere of an old Dutch patrician's house. This gave an opportunity to network with other members of the community.

Day 2 started early morning and ran three consecutive sessions of presentations. José Luis García-Lapresta, José Rui Figueria, and Salvatore Greco chaired each session respectively. Between the sessions, Caspar Chorus added into the highlight of the day with his keynote lecture on "Models of moral decision making – A discrete choice perspective". The lecture gave insights on the room for collaboration between the aspiring MCDA and choice modelling experts. The day concluded with a group picture session.

On day 3, the participants headed to Amsterdam by train and enjoyed a guided canal boat tour of some of Amsterdam’s tourist highlights. After a lunch meal at an Italian restaurant, and a pleasant walk through the mildly breezy and perfectly sunny weather, Van Gogh museum was the final destination of the day. Being a must-visit, the museum was as busy as it gets during a Saturday. Yet with the arrangement of the organizing committee, the participants had the privilege to beat the queue to enjoy the magnificent exhibits of Vincent van Gogh’s legendary paintings. After enjoying the gloriously emotional works of art of the icon of Western art, the participants parted ways and bade each other farewell.

This meeting would not have been successful without the contribution and support of each participant, keynote speaker, session chairs, and also the organizing and scientific committee. Our sincere gratitude goes to each of them for the high-quality papers, presentations, and discussions not to mention their valuable time and active participations throughout the meeting.
We hope all participants had a fruitful and insightful conference and a wonderful stay in Delft. We look forward to seeing all of you in Lisbon.

PROGRAM

Session 1 Presentation Papers | Chair: Roman Słowiński

- Valentina Ferretti, Elisa Gandino, Socio-technical challenges for MCDA to be a driver for rural regeneration
- Marta Dell’Ovo, Alessandra Oppio, Combining social and technical instances within design processes: A Value-Focused Thinking approach
- Christina Becchio, Marta Bottero, C. Ciccarelli, Stefano Corgnati, Federico Dell’Anna, G. Vergerio, *Addressing the selection of requalification strategies for university*
- Willem K.M. Brauers, Multiple Objective Optimization in Transportation Systems. The Case of Installation of a Container Terminal in a Seaport

Session 1 Discussion Papers

- Abdelali Hajbi, Hassan Abbar, Said Elmezouari, *Port investment and MCDA*
- Eric S Fraga, Carmen Wouters, Adrian M James, Multi-criteria design for residential distributed energy systems
- Christine Huttin, Engineering approaches in life science and health care and MCDA
- Eric S. Fraga, Carmen Wouters, Adrian M. James, Multi-objective optimisation for last mile delivery of perishable products
- Olga Porro, Nuria Agell, Mónica Sánchez, Towards a definition of social entrepreneurship from the perspective of traditional small and medium enterprises

Session 2 Presentation Papers | Chair: Lisa Scholten

- Masoud Khakdaman, Jafar Rezaei, Lori Tavasszy, Identifying preferences of consumer goods industry towards Synchromodal transport services
- Mladen Stamenković, Salvatore Corrente, MCDA approach to the internal migration of regions: case of Serbia
- Verónica Arredondo, Miguel Martínez-Panero, Teresa Peña, Federica Ricca, *Political districting and attention to minority groups*
- Ana Sara Costa, Isabella Lami, Salvatore Greco, José Rui Figueira, José Borbinha, A multiple criteria approach for housing assignment of migrants in the city of Turin

Session 2 Discussion Papers

- Federico Dell’Anna, José Rui Figueira, Salvatore Greco, Grazia Napoli, Assessing energy retrofit strategies for public buildings: an application of the ELECTRE-TRI nC model
- Uğur Orhan Karaköprü, Özgür kabadurmuş, Evaluation of stadium locations by using AHP-TOPSIS method

- Chiara D'Alpaos, Paolo Bragolusi, Prioritization of Incentive Policies to Buildings Energy Retrofit: an AHP model
- Tolga Genç, José António Filipe, Mehmet Kabak, Elicitation the relations of strategies of wind energy investments by means of hybrid MCDM methods
- Fernández Barberis, Gabriela García Centeno, Mª Carmen; Escribano Ródenas Mª, *Sustainable development objectives to 2030: A multiple criteria analysis*
- Lisa Scholten, Designing decision support processes to overcome barriers to sustainable water systems

Session 3 Presentation Papers | Chair: José Luis García-Lapresta

- Fouad Ben Abdelaziz, From decision to optimisation
- Maria Franca Norese, SISTI: a methodological approach to reduce uncertainty and to structure a complex and new decision problem in a "good" model
- Konrad Kułakowski, Jiří Mazurek, Jaroslaw Ramík, Michael Soltys, *When condition of order preservation is met?*

Session 3 Discussion Papers

- Yu-wang Chen, Ying Yang, Jian-bo Yang, Decision analysis using the evidential reasoning rule
- Philippe Lebrun, Fouad Ben Abdelaziz, A visual interactive method for portfolio selection
- Maria Barbati, Salvatore Greco, Miłosz Kadziński, Roman Słowiński, Optimization of project portfolio with respect to preferences concerning distribution of portfolios over satisfactory levels achieved on evaluation criteria
- Noushin Bagheri, Anath Rao, Multiobjective stochastic portfolio selection: The case of GCC Islamic securities

Keynote Lecture

Caspar Chorus, *Models of moral decision making – A discrete choice perspective*

Session 4 Presentation Papers | Chair: José Rui Figueria

- Sally Giuseppe Arcidiacono, Salvatore Corrente, Salvatore Greco, Robust ordinal regression and stochastic multicriteria acceptability analysis for the level dependent Choquet integral
- Athanasios Spyridakos, Nikos Tsotsolas, I. Vryzidis, Utilization of strength of preferences information for the effective application of UTA methods in cases with very limited actions in the reference set
- Jean Rosenfeld, Yves De Smet, Extensions of PROMETHEE to multicriteria clustering: recent developments
- José Luis García-Lapresta, Raquel González del Pozo, An ordinal MCDM procedure under imprecise linguistic assessments

Session 4 Discussion Papers

- Veronica R. Capelli, Multidimensional attitudes in intertemporal choice
- Zoumpolia Dikopoulou, Elpiniki Papageorgiou, Koen Vanhoof, Assessing sparser Fuzzy Cognitive Maps from large ordinal data using lasso graphical models and modified TOPSIS
- Camilo Franco, Gilberto Ramírez, Spatial multi-criteria analysis for optimal site location of water treatment stations in the western basin of the Bogota river
- Arayeh Afsordegan, Núria Agell, Monica Sanchez, Mar vila, Siamak Zahedi, Assessing sustainable solutions for water-energy system using qualitative multiple criteria decision aiding tools
- Chiara D'Alpaos, Flora Faleschini, Francesca Andreolli, Evaluation of seismic retrofit of industrial buildings: A hierarchical approach
- Fatima Zahra El Mazouri, 'GREP': Global Rural Electrification Program

Session 5 Presentation Papers | Chair: Salvatore Greco

- Xavier Molinero, Fabián Riquelme, Maria Serna, *Centrality on social networks*
- Geerten Van de Kaa, De Facto Standardization: An MCDM approach
- G.D.H. Claassen, D.J.C. Beemsterboer, Sihao Zhang, Xuezhen Guo, E.M.T. Hendrix, A mixed integer programming approach to identify the optimal weights in the Best Worst Method

Session 5 Discussion Papers

- Mohammad Ghaderi, Antonip Ladron de Guevara, Nuria Agell, Coloring pillars of brand personality: An empirical cross-industry study based on preference disaggregation approach
- Stelios Rozakis, Elizabieta Kubinska, A. Krol, Jacek Kozyra, Evaluation of sustainability of maize cultivation in Poland: A Prospect Theory – PROMETHEE approach
- Yves De Smet, Beyond ranking multicriteria problems: the case of PROMETHEE methods
- Jafar Rezaei, Best Worst Method: Robustness analysis and an adjusted linear model

Forthcoming meetings

MCDA 88 - 88th Meeting of EWG-MCDA
Lisbon, Portugal (Academy of Sciences of Lisbon)
September 27-29, 2018
Abstract submission deadline: June 20, 2018
http://mcda2018.idsswh.sysresearch.org/

co-located with 15th Decision Deck Workshop
Instituto Superior Técnico-ULisboa, Alameda Campus
September 26, 2018
http://ddws2018.idsswh.sysresearch.org

We cordially invite you to participate in the 88th Meeting of the EURO Working Group on Multiple Criteria Decision Aiding (EWG-MCDA), which will be held from Thursday September 27th to Saturday September 29th, 2018, at the Academy of Sciences of Lisbon, Portugal.
The main theme of this meeting is "MCDA user-friendly software tools for performance assessment of Smart Cities". All theoretical, methodological, and application studies dealing with multiple criteria decision aiding, and in particular those relative to the theme of the meeting (which, include the general Smart Cities systems, and their transportation, health, energy, economy, education, sub-systems), are welcome.

Abstract submission deadline is June 20, 2018.

Please, find additional information at
http://mcda2018.idsswh.sysresearch.org/

The organizers of 88th Meeting of EWG-MCDA can be contacted at mcda2018@gmail.com

EWG-MCDA 88 will be co-located with the 15th Decision Deck (D2) Workshop, which is oriented toward presentation of the recently developed MCDA software and case studies solved with MCDA tools. The D2 Workshop will be held on September 26th (Wednesday) at Instituto Superior Técnico-ULisboa, Alameda Campus.

Please find additional information at
http://ddws2018.idsswh.sysresearch.org,
or contact Patrick Meyer (patrick.meyer@imt-atlantique.fr) and Milosz Kadzinski (milosz.kadzinski@cs.put.poznan.pl) for further details on the D2 initiative (http://www.decision-deck.org/project/).

We are looking forward to seeing you in Lisbon.

DA2PL'2018: From Multiple Criteria Decision Aid to Preference Learning
Poznan University of Technology, Poznan, Poland
November 22-23, 2018 (Thursday-Friday)
http://da2pl.cs.put.poznan.pl

The DA2PL workshop has been launched with the goal of bringing together researchers from operations research and the decision sciences with scholars from machine learning. It aims at providing a forum for discussing recent advances and identifying new research challenges in the intersection of both fields, which is marked by the growing field of preference learning, thereby supporting a cross-fertilization of these disciplines.

Following the three previous editions of this workshop, which took place in Mons (Belgium) in 2012, Paris (France) in 2014 and Paderborn (Germany) in 2016, DA2PL'2018 will be organized at the Poznan University of Technology (Poznan, Poland). It will be held in the modern Lecture and Conference Centre that was also the main venue of EURO 2016.

DA2PL'2018 solicits contributions to the usage of theoretically supported

- preference models and formalisms in preference learning as well as
- communications devoted to innovative preference learning methods in
- decision analysis and multiple criteria decision aiding. Specific topics
- of interest include, but are not limited to:
- quantitative and qualitative approaches to modeling preferences, user feedback and training data;
- preference representation in terms of graphical models, logical formalisms, and soft constraints;
- dealing with incomplete and uncertain preferences;
- preference aggregation and disaggregation;
- learning utility functions using regression-based approaches;
- preference elicitation and active learning;
- preference learning in combinatorial domains;
- learning relational preference models and related regression problems;
- classification problems, such as ordinal and hierarchical classification;
- inducing monotonic decision models for preference representation;
- comparison of different preference learning paradigms (e.g., monolithic vs. decomposition);
- ranking problems, such as object ranking, instance ranking and label ranking;

- complementarity of preference models and hybrid methods;
- explanation of recommendations;
- applications of preference learning, such as web search, information retrieval, electronic commerce, games, personalization, recommender
- systems, ...

Submissions
Submissions must be written in English and formatted according to the electronic template that is available on the conference website. The page limit is 8 for full papers, although extended abstracts (two pages as the maximum) are welcome, too. Submissions are managed through www.easychair.org. Each paper submitted to DA2PL will be reviewed by two referees.

We also provide an opportunity for doctoral students to explore and develop their research interests. A special session at the conference will be devoted for PhD students to present and discuss their ongoing research work. Therefore we encourage young researchers to submit their work also via submission site.

Important Dates
- Submission site opens: May 1, 2018
- Paper submission deadline: September 1, 2018
- Author notification: September 30, 2018
- Camera-ready version: November 3, 2018
- DA2PL in Poznan: November 22-23, 2018

- 17-20/6/2018
2018 INFORMS International Conference
Taipei, Taiwan
http://meetings2.informs.org/wordpress/2018international/

- 18-22/6/2018
IWOBIP'18 - International Workshop on Bilevel Programming
Lille, France
https://iwobip2.sciencesconf.org/

- 18-22/6/2018
20th European Agent Systems Summer School
Maastricht, The Netherlands
https://project.dke.maastrichtuniversity.nl/easss/

- 18-20/6/2018
Matheuristics 2018
Tours, France
https://mh2018.sciencesconf.org

- 18-19/6/2018
EURO mini-conference on Logistics Analytics
Minsk, Belarus
http://www.himolde.no/la2018

- 18-21/6/2018
Mixed Integer Programming Workshop 2018
Greenville, South Carolina, USA
https://or.clemson.edu/mip-2018/

- 24-29/6/2018
ICAPS 2018 - 28th International Conference on Automated Planning and Scheduling
Delft, The Netherlands
http://icaps18.icaps-conference.org

- 25-29/6/2018
Summer School "Operations Research - Machine Learning"
Fréjus, France
https://cermics-lab.enpc.fr/summer-school-operations-research-and-machine-learning/

- 25-27/6/2018
Joint EURO/ALIO International Conference 2018 on Applied Combinatorial Optimization
Bologna, Italy
https://events.unibo.it/euroalio2018

- 26-29/6/2018
CPAIOR 2018 - 15th International Conference on the Integration of Constraint Programming, Artificial Intelligence, and Operations Research
Delft, The Netherlands
https://sites.google.com/view/cpaior2018/

- 28-30/6/2018
SmartCity-2018 - 16th IEEE International Conference on Smart City
Exeter, UK
http://cse.stfx.ca/~smartcity2018/

- 1-7/7/2018
EWG SSC EURO working group on Sustainable Supply Chains PhD summer school
Wageningen, The Netherlands
https://www.sustainablesc.rwth-aachen.de/

- 2-4/7/2018
GSC'2018 - 4th International Conference on Green Supply Chain
Thessaloniki, Greece
www.icgsc2018.org

- 3-5/7/2018
Dynamic Multi-objective Optimization (DMOO 2018)
Thessaloniki, Greece
http://inista.org/dmoo2018.html

- 5-6/7/2018
EWG-ORD workshop
Madrid, Spain

http://eventos.ucm.es/16639/detail/ewg-ord-2018-workshop.html

- 7-9/7/2018

ICMOR 2018 International Conference on Management and Operations Research
Beijing, China
http://icmor.ustb.edu.cn/

- 8-14/7/2018

OPTA 2018 - 7th International Conference on Optimization Problems and Their Applications
Omsk, Russia
http://opta18.oscsbras.ru/en/

- 8-11/7/2018

EURO 2018
Valencia, Spain
http://euro2018valencia.com/

- 12-13/7/2018

16 EUROPT Workshop on Advances in Continuous Optimization
Almeria, Spain
http://www2.ual.es/EurOPT18/

- 13/7/2018

MoRe 2018 - 1st Workshop on Multi-objective Reasoning in Verification and Synthesis
Oxford, UK
http://math.umons.ac.be/more2018/

- 15-19/7/2018

GECCO 2018 - 2018 Genetic and Evolutionary Computation Conference
Kyoto, Japan
http://gecco-2018.sigevo.org/

- 19-23/7/2018

ACDL 2018 - Advanced Course on Data Science and Machine Learning
Siena, Tuscany, Italy
https://acdl2018.icas.xyz/

- 21-25/7/2018

MESS 2018 - Metaheuristics Summer School: from Design to Implementation
Taormina, Sicily-Italy
https://www.ANTs-lab.it/mess2018/

- 23-27/7/2018

28th IFIP TC7 Conference on System Modeling and Optimization
Essen, Germany
https://udue.de/ifip2018

- 23/7-3/8/2018

EURO PhD School on MCDA/MCDM
Chania, Crete, Greece
http://www.mcda-school18.tuc.gr

- 26-27/7/2018

2nd IEOM European International Conference on Industrial Engineering and Operations Management
Paris, France
www.ieomsociety.org/paris2018/

- 6-9/8/2018

APORS 2018
Kathmanu, Nepal
http://apors2018-nepal.org/

- 13-17/8/2018

DIMACS/TRIPODS/MOPTA
Lehigh University, Bethlehem, PA.
http://coral.ie.lehigh.edu/~mopta/

- 14-15/8/2018

4th International Conference on Innovations in Computing System & Engineering Technology (ICICSET 2018)
Zurich, Switzerland
http://www.icicset.iisrcrcc.com

- 20-22/8/2018

RANDOM 2018 - The 22nd International Conference on Randomization and Computation
Princeton, New Jersey, USA
http://cui.unige.ch/tcs/random-approx/

- 20-22/8/2018

APPROX 2018 - The 21st International Conference on Approximation Algorithms for Combinatorial Optimization Problems
Princeton, New Jersey, USA
http://cui.unige.ch/tcs/random-approx/

- 20-24/8/2018

Summer School on Combinatorial Optimization
Bonn, Germany
http://www.hcm.uni-bonn.de/combinatorial-optimization-2018/

- 20-22/8/2018

ESA 2018 - 26th Annual European Symposium on Algorithms
Helsinki, Finland
http://algo2018.hiit.fi/esa/

- 20-24/8/2018

ATMOS 2018 - 18th Workshop on Algorithmic Approaches for Transportation Modeling, Optimization, and Systems
Helsinki, Finland
http://algo2018.hiit.fi/atmos/

- 27-31/8/2018

SYNERGY Summer School on Efficient Multi-Objective Optimisation
Ljubljana, Slovenia
http://summerschool.synergy-twinning.eu/

- 27-29/8/2018

2018 6th International Symposium on Computational and Business Intelligence (ISCBI 2018)
Basel
http://www.iscbi.com/index.html

- 27-31/8/2018

CP 2018 - Principles and Practice of Constraint Programming
Lille, France
http://cp2018.a4cp.org/

- 28-31/8/2018

PATAT 2018 - 12th International Conference on the Practice and Theory of Automated Timetabling
Vienna, Austria
http://patatconference.org/patat2018/

- 5-7/9/2018

IO2018 - XIX Congress of the Portuguese Association of Operational Research
University of Aveiro, Portugal
http://apdio.pt/web/io2018/home

- 8-12/9/2018

PPSN 2018 - 15th International Conference on Parallel Problem Solving from Nature
Coimbra, Portugal
http://ppsn2018.dei.uc.pt/

- 9-12/9/2018

WCO18 - 11th International Workshop on Computational Optimization
Poznan, Poland, September 9-12, 2018
https://fedcsis.org/2018/wco

- 10-13/9/2018

ODS2018 - International Conference on Optimization and Decision Science - XLVIII Annual Meeting of AIRO – Italian Operations Research Society
Taormina, Italy
http://www.airoconference.it/ods2018

- 11-13/9/2018

OR60 'Anniversary' Conference
Lancaster, UK
http://www.theorsociety.com/Pages/Conferences/OR60/OR60.aspx

- 12-14/9/2018

Operations Research 2018
Brussels, Belgium
https://www.or2018.be

- 13-16/9/2018

LOD 2018 - 4th International Conference on machine Learning, Optimization & Data science
Volterra (Pisa) Tuscany, Italy
https://lod2018.icas.xyz/

- 13-14/9/2018

EURO working group on Humanitarian Operations, HOpe. 3rd EURO Working Group Mini-Conference on Humanitarian Operations
Leuven, Belgium
https://feb.kuleuven.be/drc/Operations%20Management/misc/GSKchair/events/eurohope

- 14-15/9/2018

2nd IMA Conference on Theoretical and Computational Discrete Mathematics
University of Derby
https://ima.org.uk/7775/2nd-ima-conference-theoretical-computational-discrete-mathematics/

- 17-19/9/2018

21st Meeting of the EURO Working Group on Transportation (EWGT 2018)
Braunschweig, Germany
http://ewgt2018.org/cms/

- 17-21/9/2018

IFIP World Computer Congress (WCC)
Poznan, Poland
http://wcc2018.put.poznan.pl/

- 17-19/9/2018

EngOpt 2018 - 6th International Conference on Engineering Optimization
Lisbon, Portugal
http://engopt2018.tecnico.ulisboa.pt/

- 24-27/9/2018

CLAIO2018. XIX Latin-Iberoamerican Conference on Operations Research
Lima, Perú
http://www.sopios.org.pe/claio2018

- 26-28/9/2018

17th International Conference on Operational Research. KOI 2018.
Zadar, Croatia
http://hdoi.hr/koi2018/

- 1-3/10/2018

9th International Conference on Computational Logistics (ICCL 2018)

Vietri sul Mare (Salerno) - Italy
http://www.iccl2018.it

- 4-5/10/2018

1st International Conference on Intelligent Computing & Optimization 2018
Pattaya, Thailand
https://www.icico.info/

- 4-7/10/2018

ICVNS 2018 - 6th International Conference on Variable Neighborhood Search
Sithonia, Halkidiki, Greece
http://vns2018.uom.gr

- 10-11/10/2018

ISESO 2018 - 2nd International Symposium on Energy System Optimization: Bridging the Gap between Mathematical Modelling and Policy Support
Karlsruhe, Germany
https://www.iseso.org/#node-home

- 22-27/10/2018

9th Moscow International Conference on Operations Research ORM 2018
Moscow, Russia
http://io.cs.msu.ru/ORM2018.html

- 24-25/10/2018

RTDM 2018 - Symposium on Rail Transport Demand Management
Darmstadt, Germany
http://www.rtdm2018.de

- 27-31/10/2018

META'2018 - International Conference on Metaheuristics and Nature Inspired Computing
Marrakech, Morocco
http://meta2018.sciencesconf.org/

- 29-31/10/2018

ANTS 2018 - 11th International Conference on Swarm Intelligence
Rome, Italy
http://www.swarm-intelligence.eu/ants2018/

- 4-7/11/2018

2018 INFORMS Annual Meeting
Phoenix, AZ, USA
http://meetings2.informs.org/wordpress/phoenix2018/

- 22-23/11/2018

DA2PL'2018: From Multiple Criteria Decision Aid to Preference Learning
Poznan, Poland
http://da2pl.cs.put.poznan.pl

- 10-11/12/2018

3rd IMA Conference on The Mathematical Challenges of Big Data
Double Tree by Hilton Hotel London, UK
https://ima.org.uk/9104/3rd-ima-conference-on-the-mathematical-challenges-of-big-data/

- 10-13/12/2018

IEEE Big Data 2018 - IEEE International Conference on Big Data
Seattle, WA, USA
http://cci.drexel.edu/bigdata/bigdata2018/index.html

- 16-19/12/2018

ISAAC 2018 - 29th International Symposium on Algorithms and Computation
Jiaoxi, Yilan County, Taiwan
http://isaac2018.ie.nthu.edu.tw/

- 16-19/12/2018

IEEM 2018 - IEEE International Conference on Industrial Engineering and Engineering Management
Bangkok, Thailand
http://www.ieem.org

- 17-19/12/2018

Vienna Workshop on Computational Optimization
Vienna, Austria
http://vwco18.univie.ac.at/

- 16-18/1/2019

HM 2019 - 11th International Workshop on Hybrid Metaheuristics
Concepción, Chile
http://hm2019.ing.udec.cl/

- **89th Meeting of EWG-MCDA**

University of Trento, Trento, Italy
April 11-13, 2019 (more likely) or April 4-6, 2019
Main organizers: Michele Fedrizzi and Matteo Brunelli

- 10-12/6/2019

INOC 2019 International Network Optimization Conference
Avignon, France
https://inoc2019.sciencesconf.org/

- 16-21/6/2019

The 25th International Conference on Multiple Criteria Decision Making (MCDM 2019)
Istanbul, Turkey
http://www.mcdm2019.org/

- 23-26/6/2019

EURO 2019
Dublin, Ireland

- 28-30/8/2019

9th IFAC Conference on Manufacturing Modeling, Management and Control MIM 2019
Berlin, Germany
https://blog.hwr-berlin.de/mim2019

- **90th Meeting of EWG-MCDA**

IMT Atlantique, Brest, France
September or October, 2019
Main organizer: Patrick Meyer
(colocated with 16th Decision Deck Workshop)

Seminars

SEMINAIRE « MODELISATION DES PREFERENCES ET AIDE MULTICRITERE A LA DECISION »

Responsable: Daniel VANDERPOOTEN
(le mardi à 14h00 – salles à préciser)

Prochaines réunions

15 mai 2018 Conférence de **Satya Tamby**
LAMSADE**,** Université Paris Dauphine
Une nouvelle approche générique pour la résolution de problèmes d'optimisation combinatoire multiobjectif

5 juin 2018 Conférence de **Carlos Henggeler Antunes**
University of Coimbra
Semivectorial bilevel programming: illustration of different concepts of solutions and an application to the optimization of electricity time-of-use retail pricing

17 octobre 2017 Conférence de **Yann Chevaleyre**
LAMSADE – Université Paris Dauphine
Apprentissage de modèles interprétables pour la décision

14 novembre 2017 Conférence de **Olivier Cailloux et Yves Meinard**
LAMSADE – Université Paris Dauphine
A formal framework for deliberated judgment

5 décembre 2017 Conférence de **Brice Mayag**
LAMSADE – Université Paris Dauphine
Negative interactions between criteria are not necessary in MCDA

23 janvier 2018 Conférence de **Khaled Belahcene**
Laboratoire Génie Industriel, CentraleSupélec, Université Paris-Saclay)
Explications de décisions multicritères

Web site for Annoucements and Call for Papers:
www.cs.put.poznan.pl/ewgmcda

Books

Elicitation
The Science and Art of Structuring Judgement

Luis C. **Dias**, Alec **Morton**, John **Quigley** (Eds.)

Springer (Series: International Series in Operations Research & Management Science), 2018

This book is about elicitation: the facilitation of the quantitative expression of subjective judgement about matters of fact, interacting with subject experts, or about matters of value, interacting with decision makers or stakeholders. It offers an integrated presentation of procedures and processes that allow analysts and experts to think clearly about numbers, particularly the inputs for decision support systems and models. This presentation encompasses research originating in the communities of structured probability elicitation/calibration and multi-criteria decision analysis, often unaware of each other's developments.
EWG-MCDA researchers may find here not only chapters on eliciting preferences (utility, value and ELECTRE) and chapters on cross-cutting issues (biases and selection of experts), but also several chapters on probability elicitation that might inspire future developments in the MCDA field.

Table of contents:

1. Elicitation: State of the Art and Science - Luis C. Dias, Alec Morton, and John Quigley
2. Elicitation in the Classical Model - John Quigley, Abigail Colson, Willy Aspinall, and Roger M. Cooke
3. Validation in the Classical Model - Roger M. Cooke
4. SHELF: The Sheffield Elicitation Framework - John Paul Gosling
5. IDEA for Uncertainty Quantification - Anca M. Hanea, Mark Burgman, and Victoria Hemming
6. Elicitation and Calibration: A Bayesian Perspective - David Hartley and Simon French
7. A Methodology for Constructing Subjective Probability Distributions with Data - John Quigley and Lesley Walls
8. Eliciting Multivariate Uncertainty from Experts: Considerations and Approaches Along the Expert Judgement - Christoph Werner, Anca M. Hanea, and Oswaldo Morales-Nápoles
9. Combining Judgements from Correlated Experts - Kevin J. Wilson and Malcolm Farrow
10. Utility Elicitation Jorge González-Ortega, Vesela Radovic, and David Ríos Insua

11. Elicitation in Target-Oriented Utility - Robert F. Bordley
12. Multiattribute Value Elicitation - Alec Morton
13. Disaggregation Approach to Value Elicitation - Nikolaos F. Matsatsinis, Evangelos Grigoroudis, and Eleftherios Siskos
14. Eliciting Multi-Criteria Preferences: ELECTRE Models - Luis C. Dias and Vincent Mousseau
15. Individual and Group Biases in Value and Uncertainty Judgments - Gilberto Montibeller and Detlof von Winterfeldt
16. The Selection of Experts for (Probabilistic) Expert Knowledge Elicitation - Fergus Bolger
17. Eliciting Probabilistic Judgements for Integrating Decision Support Systems - Martine J. Barons, Sophia K. Wright, and Jim Q. Smith
18. Expert Elicitation to Inform Health Technology Assessment - Marta O. Soares and Laura Bojke
19. Expert Judgment Based Nuclear Threat Assessment for Vessels Arriving in the - Jason R. W. Merrick and Laura A. Albert
20. Risk Assessment Using Group Elicitation: Case Study on Start-up of a New Logistics System - Markus Porthin, Tony Rosqvist, and Susanna Kunttu
21. Group Decision Support for Crop Planning: A Case Study to Guide the Process of Preferences Elicitation - Pavlos Delias, Evangelos Grigoroudis, and Nikolaos F. Matsatsinis

Articles Harvest

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

Abdulkader, M.M.S., Gajpal, Y., ElMekkawy, T.Y. (2018). Vehicle routing problem in omni-channel retailing distribution systems. *International Journal of Production Economics*, 196, 43-55.

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Alfares, H.K., Turnadi, R. (2018). Lot sizing and supplier selection with multiple items, multiple periods, quantity discounts, and backordering. *Computers and Industrial Engineering*, 116, 59-71.

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Alinaghian, M., Shokouhi, N. (2018). Multi-depot multi-compartment vehicle routing problem, solved by a hybrid adaptive large neighborhood search. *Omega*, 76, 85-99.

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Announcement:

The "Useful links" section of the group's homepage

(www.cs.put.poznan.pl/ewgmcda)

is being enlarged. Contributions of URL links to societies, research groups and other links of interest are welcome.

A membership directory of the European Working Group on "Multiple Criteria Decision Aiding" is available at the same site. If you would like to be listed in this directory please send us your data (see examples already in the directory).

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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.

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This newsletter is published twice a year by the "EWG on MCDA", in November/December and April/May , with financial support of the Association of European Operational Research
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