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Eric Jacquet-Lagrèze (1947–2017)

On May 7, 2017, Eric Jacquet-Lagrèze, a leading French pioneer in the field of preference analysis, multiple criteria decision aiding (MCDA), and OR based decision support systems, passed away.

Eric Jacquet-Lagrèze, was born in Fécamp (France) in 1947. Engineer graduated from Ecole Centrale de Paris, he got his PhD diploma in 1977 and Doctorat d'Etat in 1981 in operational research and management science in France. During years 1972-1976, Eric worked as research engineer in SEMA society, while in years 1976-1987, he worked as assistant professor at the University of Paris-Dauphine and researcher at the LAMSADE laboratory founded by Professor Bernard Roy in 1975. In 1977, he met Yannis Siskos to whom he passed the idea of disaggregation in MCDA via ordinal regression approach. One year later, in May 1978, Eric and Yannis published their seminal paper on the UTA method, firstly in Cahiers du LAMSADE series, and later, in 1982, in the European Journal of Operational Research (EJOR). The last revision of this paper was made in the Eric's car during the authors' trip from Hamburg to Paris after the presentation of the UTA software during the IFORS'81 Conference. The disaggregation approach proposes to infer formal decision models from global preference structures. In particular, the UTA method aims at inferring one or more additive value functions. Together with UTA, they developed some theory and heuristics of stability/robustness analysis to handle the difficult problem of multiple and near optimal solutions in linear programming, initiating the robust ordinal regression theory. According to the report of the editor-in-chief, the UTA paper is among the 30 most cited papers in the history of EJOR. Later, a big number of MCDA methods were developed by other scientists on the basis of UTA, such as UTADIS, UTA^{GMS}, GRIP, ACUTA, and RUTA. In 2001, Eric and Yannis published a second paper in EJOR to celebrate the twenty years of MCDA experience with disaggregation methods.

Eric refused to compromise with the university status of France, which was unfair to the science of operational research. Thus, he decided in 1987 to abandon the academic life in order to create with Denis Montaut the society EURODECISION, which immediately gained a high position on the resource optimization market. Its first clients were companies, such as Air France, RATP (Paris public transport agency), and Renault. EURODECISION quickly acquired a solid reputation in applications of operational research methods to solving particularly complex real-world decision problems.

In January 2012, Eric founded the Tensing Editions that publishes novels, biographies, poetry in printed and e-book versions. Eric passed his childhood in the city of Fécamp on the Normandy coast at one time when the trawlers still left for the fishing season to Newfoundland. These landscapes and his love of the veil and long journeys at sea provided most of the inspiration of his last writings. His vast experiment of the mountaineering and his travel to India and the Himalayas are also reflected in his collection of news, Namasté, and in his novel, the cedars of Kanchenjunga.

Eric was a visionary scientist and entrepreneur. With his beloved spouse Christine they raised four children, two daughters Manon and Adèle and two sons Thibaut and Matthias.

Adieu Eric, Καλό ταξίδι.
Yannis Siskos

Opinion Makers Section

MCDA for integrated sustainability assessments of urban systems

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1. Introduction

The problems related to cities are assuming more and more importance in the policy-maker’s agenda during the last years. In this sense, it is possible to highlight that, in 2010, 50% of the world’s population lived in urban areas, and this figure is forecast to rise to 75% by 2050 (UN 2008). Due to this increase in urban population, governments are required to figure out how to create spaces for the citizens in the future. In this sense, it is also necessary to think about the future quality of life in cities and two seems to be the emerging issues in this domain: the paradigm of the smart city and the concept of urban resilience.

2. Smartness and resilience in urban systems

A first issue involving the future of urban systems is related to the concept of smart cities, which can be defined as those cities that utilize information-and-communication technologies (ICT) with the aim to increase the life quality of their inhabitants while providing sustainable development. According to the scientific literature (Centre for Regional Science 2007), six axes exist for the creation of a smart city; these axes can be described as follows: 1) smart governance, 2) smart economy, 3) smart people, 4) smart living, 5) smart environment, and 6) smart mobility (Figure 1). Following this definition, cities should base their smart-city models on a profound attention to the role of human and relational capital in urban development and on the integration of social and environmental sustainability as a major strategic component of cities quality (Caragliu et al. 2009; Murgante and Borruso, 2015).
In this sense, in order to face the future problems related to cities, a very important topic is connected to the reduction of soil consumption (Bottero, 2015). According to this approach, a crucial role is played by urban regeneration operations, meaning not only building-restoration operations, but also programs aiming at eliminating social decline, increasing the quality of life of the inhabitants, supporting the valorization of cultural resources, protecting the environmental system, bringing economic development, and so on (Roberts and Hugs, 2000).

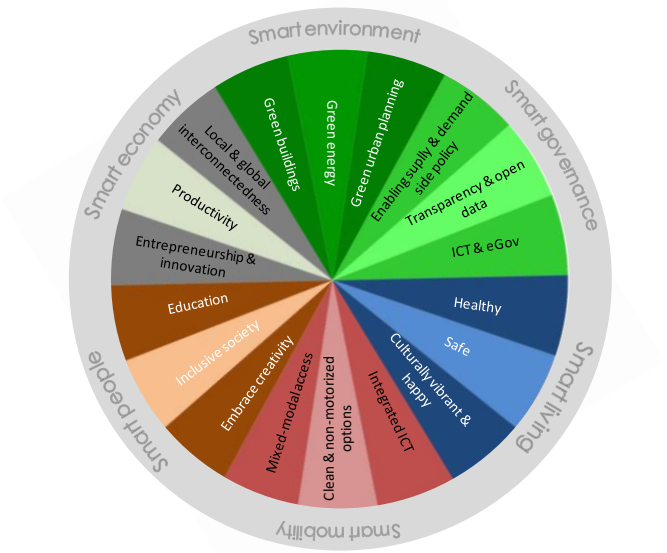

Fig. 1 The concept of smart city represented by the “Smart City Wheel” (elaboration from Cohen 2013)

The second issue emerging in the context of decision-making processes in cities is related to the concept of urban resilience. Traditionally the concept of resilience has been used in engineering to indicate the ability of an object to return its original position after a disturbance, which could be a natural disaster, such as flooding, or a social upheaval, such as economic crises or wars. Later on, Holling (1973) put in evidence the existence of a ecological resilience, which is the magnitude of the disturbance that can be absorbed before the system can change its structure. More recently, the concept of urban resilience has been introduced for describing the ability to absorb, adapt and respond to changes in an urban system, including different recent urban issues, such as sustainability, governance and economic development (Figure 2). Examples of factors affecting urban resilience can be related to the vulnerability of flooding, the infrastructural development, the presence of architectural and cultural heritage, the existence of social barriers, the demographic change, only to mention some elements (Oppio and Corsi, 2017). It is imperative for cities to be resilient if they can be considered smart (Desouza and Flanery, 2013).
Many applications of the theory of engineering and ecological resilience exist in different domains, such as environmental risk, transport planning, climate change, ecology, to name a few. In the domain of urban planning, although the concept of resilience is very new, it is rapidly gaining attention (Davoudi et al., 2012; Collier et al., 2013; Bond et al., 2015; Meerow et al., 2016) but the development of tools for assessing urban resilience is very limited at the moment (Norese et al., 2016).

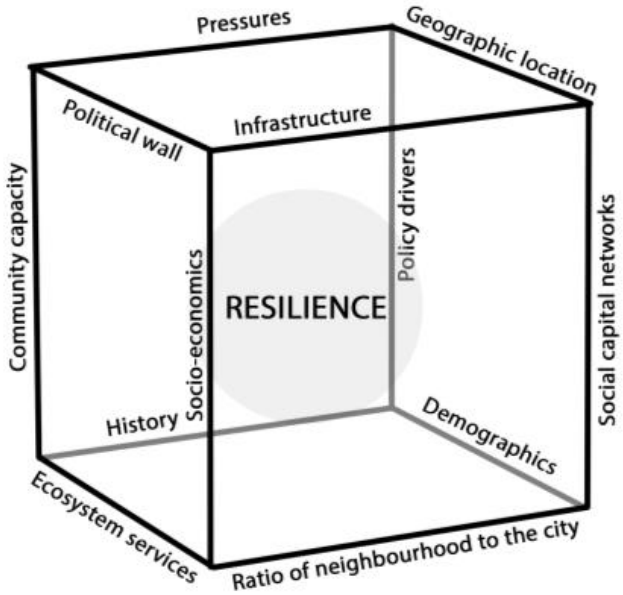

Fig. 2 Muldimensionality of the concept of urban resilience (elaboration from Collier et al., 2013)

3. MCDA and integrated sustainability assessment

In the light of the aforementioned issues, urban areas are complex and dynamic systems, reflecting the processes that drive physical, social, environmental, and economic transition and generating themselves important changes. Taking into consideration this complexity, it is of particular importance to provide the decision makers with integrated evaluation tools, able to consider the multiplicity of objectives and values when dealing with urban processes and to include the opinions and the needs of the different stakeholders involved (Bottero and Mondini, 2017).

Traditionally, the assessment of urban and territorial transformation scenarios has been based on the application of economic analysis, such as cost-benefit analysis. Many authors have highlighted the limits of economic analysis in addressing urban and territorial transformation decision problems; these limits are mainly related to a reductionist approach that does not enable consideration of the overall complexity of the system, and to the impossibility of including stakeholders in the decision-making process (Munda, 2004; Cinelli et al., 2014). For these reasons, methods belonging to the family of Multicriteria Analysis have become more and more important as they allow integrated approaches to be implemented and participated processes to be developed (Belton and Steward, 2002; Figueira et al., 2005; Bouyssou et al., 2006).

Following this reasoning, it is clear that addressing the challenges of sustainability of urban and territorial transformations requires a trandisciplinary integrative science which is able to deliver collaborative tools for supporting the development of social learning processes (Roy and Bouyssou, 1993; Roy, 2010) where the evaluation is not seen as 'one-shot activity', rather as a process where DM and stakeholders learn about the problems while they are solving them.

In this sense, MCDA methods seems to be a very appropriate approach for dealing with the new challenges that urban and transformation processes are highlighting, proposing innovative procedures based on the capacity of integrating perspectives and disciplines to overcome complexity, uncertainty and conflicts and to deliver sustainable and resilient projects.

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MCDA Research Groups

Multicriteria Decision Aid in University Rey Juan Carlos

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The research group

Multicriteria Decision Aiding Group of the University Rey Juan Carlos (URJC) is composed by 2 professors: Jaime Manera Bassa, from the Department of Economy's Entreprise, and María de Vicente y Oliva, from the Department of Financial Economics and Accounting; and eventually by PhD. students. Our group belongs to the Multicriteria Decision Spanish Group with a specific node inside the network: "URJC-Ayuda Multicriterio a la Decisión" and we try to be active in multiple workshops and conferences.

Overview of the group's work

The work of the group is mostly devoted to application of multicriteria methods to real cases and situations. We do not focus on the use of a single method but try to apply those methodologies that best fit the specific problem we are dealing with. Nevertheless, outranking methods are present on most part of our works follow by AHP implementations. The main part of our work is the application of our expertise to research projects or collaborative projects between university and enterprises. Results from these projects have been presented in conferences and published in different journals. Some of the areas of application of these projects are:

- Regional Economics
- Enterprise management
- Health Systems Management
- Research and Development
- Innovation and Social Innovation

One of the characteristics of our work is the fact that we usually work with big databases. If for "Health Systems Management" we can speak of multicriteria decision aiding, for the rest of applications is usually multicriteria "evaluation" aiding. One of the things that differentiate some multicriteria evaluation problems from classical multicriteria decision problems is the dimension of the problem. Usually, evaluation problems have much more items to be evaluated than alternatives exist in a decision problem. In our studies, we evaluate many enterprises, or many people, or many European regions, or many research centers… We even have sometimes a great number of criteria as well. This fact may not be important from a theoretical point of view, but it is from a computational point of view. We had several problems in the past to deal with databases as the software wasn't prepare to work with matrices of those dimensions. In this respect, DIVIZ software has been of great help and, but for AHP applications, is the software we use today in all our works.
Maybe because of the nature of the databases we work with, we have used MCDA methods along with other methods such as DEA (Data Envelopment Analysis) and multivariate Data Analysis. Data Analysis has been used obviously to reduce dimension in the criteria set but also as a tool to visualize some technical parameters for ELECTRE methods or even to create clusters from rankings obtained from ELECTRE III. As for the conjoint use of DEA and MCDA methods, we have used ELECTRE III to refine the set of efficient solutions after an efficiency analysis obtained with DEA. The greater the number of inputs and

outputs the greater the number of efficient alternatives proposed by DEA. As we worked with a high dimensional set of criteria, we were facing solutions that included too many efficient alternatives that weren't in fact efficient. This is a natural consequence of the technical limitations of DEA technique. Thanks to the application of ELECTRE III, we could build a robust ranking from the cross-efficiency matrix and we could propose a much more realistic set of efficient alternatives

Most relevant projects

Earlier projects:

We begin with a series of Projects of regional economy that was performed in collaboration with Professor Miguel Ángel Marcos of University Rey Juan Carlos.

"Galicia y la Política Regional Comunitaria. Evolución y Perspectivas hacia el horizonte del 2006." This project was funded by the Ministry of Economy and Finance of the Xunta de Galicia during the year 2002. A classification of the European Regions was built considering a big deal of information under the form of criteria. This was an alternative way of analyzing the process of cohesion of different regions taking into account not only the information provided by GDP but other social criteria. The focus was put on the Region of Galicia (Spain).
Similar analysis was applied to another three projects:

- "La Contribución de los Fondos Europeos al cumplimiento de la política regional comunitaria en la Comunidad de Madrid (2002)". In this case the focus was Madrid Region and its evolution during several years.
- "Plan estratégico de la Región de Murcia 2007-2013". This Project was carried out during 2005-2006 to help in the Strategic Plan for the Region of Murcia.
- "Caracterización Socioeconómica y Medida de la Cohesión entre las Regiones de la UE-15". This Project was carried out during 2004 and 2005. This project assumed the generalization of the methodology used in the previous projects as a tool for regional economy to classify European regions under socio-economic criteria and to study the evolution of the regions in a period of time.

During the years 2003 and 2004, in collaboration with the Agency for the development of the north of Morocco and Spanish Agency for International Cooperation (AECI), we applied AHP methodology to rank the projects proposed to the government of Morocco. Our contribution to the project was called "L'analyse de decisión multicritère dans l'APDN"
From 2006 to 2008 the Spanish Ministry of Education and Science funded a project entitled "Evaluación del Programa de Ayuda a las OTRIs: resultados y factores". This project was done in collaboration with Polytechnic University of Madrid. From University Rey Juan Carlos three people formed the research team: Jaime Manera, María de Vicente and a Rocío Guede (a Phd student at the time of the project). In this case the goal of the project was an efficiency analysis of the Research and Technology Transfer Offices in Spain. As we outlined in the introduction, in this case we used ELECTRE III to refine the set of efficient solutions after the efficiency analysis obtained with DEA. Good and robust results were found.

Recent projects

From 2013 to 2015 our contribution to research projects was focused on health management of public hospitals of Madrid Region. Two national projects were done in collaboration with two PHD students (Pablo de Miguel and Isabel Caballero):

- "Evaluación Comparativa de Resultados del Agrupador Casuística Poblacional en la Totalidad de un Área de Salud usando Fuentes de Información Alternativas"
- "Evaluación de los Sistemas de Clasificación APR-GRD e IR-GRD en la Medida de la Casuística de un Hospital".

Spanish Public Hospitals financing for proper hospital activity basically depends on the attended pathologies. These pathologies are grouped thanks to a Patients Classification System (PCS). In these projects, we studied the different alternatives of PCS for a set of Public Hospitals in Madrid Region. The goal was to provide a recommendation for a PCS that fitted well enough to the specific situation of these Hospitals. We considered as a case study the Fuenlabrada Hospital (the university Hospital of URJC).
Recently, from 2015 onwards, in two separate research projects, we have studied the Enterprises Incubators in Spain. The Spanish Foundation of Savings Banks (FUNCAS) has founded two reports called "Ranking de Viveros de Empresas en España 2015" and "Ranking de Empresas de Viveros en España 2016". These two reports provide a ranking of Spanish Entreprises Incubators in Spain for 2015 and 2016. The projects were done in collaboration with Professor Francisco J. Blanco of University Rey Juan Carlos.

Future projects

We have begun to work on social innovation and we are studying the social impacts of social innovation in the society. First studies focused on the study of efficiency and excellence in social innovation both from a multicriteria point of view. The meaning of efficiency and excellence should be stablished in MCDA terms and the approach that fit correctly must be chosen. So far, we have proposed a model to contrast with some enterprises belonging to social economy in Madrid but future developments are needed.

Software

MCDA Package for R

Richard E. Hodgett, Patrick Meyer, Tatiana Mironova, Alexandru-Liviu Olteanu

There have been a number of published studies that review MCDA software, the most notable being the running series of decision analysis software surveys published by OR/MS Today. OR/MS Today has published eleven separate software surveys since 1993 where each survey lists software and its associated features from many different developers and vendors. The software featured changes in each survey with fewer than half of the software packages listed in the 2014 survey (Patchak, 2014) being listed in the 2012 study (Buckshaw, 2012). Further to the OR/MS Today software surveys, Mustajoki & Marttunen (2013) compared the features of 23 MCDA software packages with the aim to inspire development of their own tool for supporting environmental impact assessment. French & Xu (2005) also comprehensively reviewed the suitability of five MCDA software packages for various decision-making processes.

It’s clear from the prior MCDA software reviews that most of the MCDA software available today focuses on one or a small number of algorithms, are difficult to adapt and interface with other tools and only a few belong to dynamic communities of contributors allowing them to expand in use and functionality. With the MCDA package for R we aim to address these issues by offering a wide range of MCDA algorithms that can be used on any operating system / online server and is supported by a diverse and expanding group of researchers and developers.

At this point you may be asking why R? Well it’s an open source programming language built with analytics in mind. It has become increasingly popular in recent years according to the IEEE annual publication on the top programming languages:

2014	2015	2016
1. Java	1. Java	1. C
2. C	2. C	2. Java
3. C++	3. C++	3. Python
4. Python	4. Python	4. C++
5. C#	5. C#	5. R
6. PHP	6. R	6. C#
7. Javascript	7. PHP	7. PHP
8. Ruby	8. JavaScript	8. JavaScript
9. R	9. Ruby	9. Ruby
10. MATLAB	10. Matlab	10. Go

As you can see, according to IEEE, R has continually increased in popularity since 2014, becoming the 5th most popular programming language in 2016. Perhaps due to the increased popularity it has also been integrated into popular software and adapted in many ways. It was recently integrated into the latest version of SQL server while certain packages have been developed to work directly with big data systems such as Apache Spark. There are versions of R which work on Windows, Linux, Mac and versions designed to run on servers. The most popular programs to utilise R are the original R distribution from the CRAN repository, R Studio and Microsoft R Open. R Studio has the advantage of an improved user interface and features for debugging while Microsoft R open is designed for parallel processing and has features for checkpoints. All of these programs support the MCDA package for R which can easily be downloaded and installed with a few simple commands. Let’s go through a quick and easy example.

First download any of the programs mentioned previously and when you open it you will be presented with the R console (for R Studio users this will be at the bottom left of the screen). This is a command line interface where you can do all sorts of analytical wizardry. To download and install the MCDA package for R you need to type and execute two commands:

```
install.packages("MCDA")
```

```
library("MCDA")
```

The first command downloads and installs the MCDA package onto your computer and the second adds the package to your library. If you close R and want to use the previously installed MCDA package again you will need to use `library("MCDA")`.

Now that the MCDA package is in your R library you are able to use the functions included in the package. For help with the functions you can simply type a question mark then the function name, for example try `?AHP` or `?TOPSIS`.

Let’s go through a simple example using AHP. Suppose you have been offered a company car and you are able to select between four car models (Corsa, Clio, Fiesta and Sandero) and you have identified 3 criteria on which to base your decision:

- Style: because you want to look the part.
- Reliability: because you can’t be breaking down on the way to meetings.
- Fuel economy: because the company aren’t offering you a fuel allowance.

As most of you will know, AHP requires decision-makers to provide their preferences as pairwise comparisons stored in the form of reciprocal matrices where the preferences are computed by calculating the principal eigenvectors or geometric mean.

You have provided your pairwise comparisons for the criteria weights and for the alternatives with respect to each of the criteria below:

```
criteriaWeightsPairwiseComparisons <-
t(matrix(c(1,0.5,3,2,1,4,1/3,0.25,1),
nrow=3, ncol=3))

colnames(criteriaWeightsPairwiseComparisons)
= c("style","reliability","fuel")

rownames(criteriaWeightsPairwiseComparisons)
= c("style","reliability","fuel")

style <-
t(matrix(c(1,0.25,4,1/6,4,1,4,0.25,0.25,0.2
5,1,0.2,6,4,5,1), nrow=4, ncol=4))

colnames(style) =
c("Corsa","Clio","Fiesta","Sandero")

rownames(style) =
c("Corsa","Clio","Fiesta","Sandero")

reliability <-
t(matrix(c(1,2,5,1,0.5,1,3,2,0.2,1/3,1,0.25
,1,0.5,4,1), nrow=4, ncol=4))

colnames(reliability) =
c("Corsa","Clio","Fiesta","Sandero")

rownames(reliability) =
c("Corsa","Clio","Fiesta","Sandero")

fuel <-
t(matrix(c(1,2,4,1,0.5,1,3,2,0.25,1/3,1,0.2
,1,0.5,5,1), nrow=4, ncol=4))

colnames(fuel) =
c("Corsa","Clio","Fiesta","Sandero")

rownames(fuel) =
c("Corsa","Clio","Fiesta","Sandero")

alternativesPairwiseComparisonsList <-
list(style=style, reliability=reliability,
fuel=fuel)
```

This code creates four matrices; `criteriaWeightsPairwiseComparisons`, `style`, `reliability` and `fuel`. Try calling these back to see the matrices that we created. In the code we used six different functions:

- **`matrix`**: creates a matrix with arguments data (the data that goes into the matrix), `nrow` (number of rows) and `ncol` (number of columns).
- **`c`**: combines values into a vector or list
- **`t`**: used to transpose the matrix
- **`list`**: creates a list, in this case of three matrices.
- **`colnames & rownames`**: set the names of the columns and rows

Now that we have our criteria weights pairwise comparisons matrix and list of alternative pairwise comparison matrices we can use the AHP function:

```
AHP(criteriaWeightsPairwiseComparisons,
alternativesPairwiseComparisonsList)
```

This gives us our AHP results for each alternative calculated through the principal eigenvector method:

```
      Corsa       Clio      Fiesta     Sandero
0.29222563 0.27674992 0.06974009 0.36128436
```

From this we can identify that Sandero scored the highest so is the recommended alternative for this quick example. In practice, there are many other things we need to consider like if each of the reciprocal matrices are consistent (i.e. the decision-maker has provided consistent selections in their pairwise comparisons). We can do this using the `pairwiseConsistencyMeasures` function, for example:

```
pairwiseConsistencyMeasures(criteriaWeights
PairwiseComparisons)

pairwiseConsistencyMeasures(style)

pairwiseConsistencyMeasures(reliability)

pairwiseConsistencyMeasures(fuel)
```

This will give us the popular consistency ratio value proposed by Saaty (1980), Koczkodaj's Measure proposed by Koczkodaj (1993) and the congruence and dissonance measures proposed by Siraj et al. (2015) for each of the matrices. There are obviously many other things you would need to consider in a MCDA analysis. Like with most MCDA software this tool is aimed at experts who know what are the appropriate methods to use with particular problems and have an understanding of the algorithmic procedures. This is discussed at length along with another more extensive illustrated example of how to use the MCDA package for R in a recently published paper in the EURO Journal on Decision Processes (Bigaret et al., 2017).

Currently the MCDA package for R supports MCDA methods such as weighted sum, AHP, TOPSIS, MARE, MR-Sort and UTA along with many other functions for data manipulation and visualisation. Work on the package is ongoing with other MCDA methods such as ELECTRE, PROMETHEE and Goal Programming in development by the current package authors. We are always looking for more contributors to the MCDA package for R, so if you have expertise in R programming or are eager to learn, please do get in touch!

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Consultancy company

Lessons Learned from Practical Applications of Multi Criteria Decision Aiding

Abstract

Having reviewed a large number of multi-criteria decision aiding projects from multiple companies across multiple sectors, it is evident that, for such a commonly-used process, the outcomes can be far less robust than expected. In many cases the preferred option was dropped for an alternative option by senior management or the preferred option turned out to be much less attractive than the scores suggested and better alternatives existed.
We are continually looking to improve our products and processes and we have considered why this might be the case and what can be done to improve the overall process. We used a scientific approach to understand the root causes and identified how we could improve the outcomes. Based on this research we have enhanced our software and workshop practices accordingly so that we can deliver significantly more robust evaluations for our Clients.
This article gives a brief outline of some of the steps we have taken that we believe will improve the process. A more detailed explanation is covered in our book "Successful Problem Solving".

Introduction

Multi Criteria Decision Aiding (MCDA) is fundamentally very straightforward. The aim is to generate an aggregate score from several different factors. The option that has the highest aggregate score is the preferred option. Whilst this can be represented by algebra and equations to make it appear "academic" it can easily be represented in words that a high school student would understand.
All STEM (science, technology, engineering, mathematics) students are taught at an early stage that you cannot add together quantities that have different units. So you can't have an equation that adds meters and kilograms. So, if you have multiple factors, each of which have different units, you cannot just add them up. You either have to make all the units of the equation the same (e.g. $) or make them dimensionless (no units). In MCDA (specifically multi utility attribute theory) the units are made dimensionless by converting each one to a 0 -100 scale. This is done by mapping or converting the actual units of the factor with points on the dimensionless scale. The mapping can be linear or it can be a curve. Then it is necessary to ensure that 100 on one scale is equivalent to a 100 on another scale. This is called weighting and ensures that the dimensionless scales are comparable across all criteria. Finally, once all the units are the same and the scale lengths are adjusted, the criteria can be scored and the weighted values added together. What could be simpler?
In reviewing many examples, running numerous workshops and delivering training sessions it is clear that many people are quite happy to switch off their critical thinking skills when participating in MCDA. They brainstorm some options and criteria, weight the criteria based on what they think is most important and score options on a simple scale such as 1-5. The option with the biggest overall score (sum of the weight times score) wins.
When you step back and think about how far away this commonly-used approach is to a mathematically sound approach it is perhaps not surprising that many of the results obtained are not robust. The commonly-used approach appears scientific, since it uses numbers. However, although it is often presented as being plausible it is rarely based on a thorough understanding of the mathematics involved.

Unpicking the elements of MCDA

At a high level the main steps in MCDA are simple:

Step	Activity
1	Identify Options
2	Identify Criteria
3	Weight Criteria
4	Score Options
5	Analyse Results

A common approach is to use consensus decision making whereby a group of experts are involved at each step. Thus, the argument goes, there will be complete buy-in to the result at the end of the process.
We considered each separate step of the process and identified where errors might be introduced. Once these areas had been identified, we looked at methods to remove or reduce those errors.

Step 1: Options

Some key questions for this stage are: What are the options? Are they consistent? Are they complete?

Whilst most of the effort in MCDA traditionally lies in developing criteria, weighting them and then scoring the options the result will clearly not be robust if the options being evaluated are not the right ones. The typical approach of brainstorming options in a workshop-type environment often results in potential options not being considered (because the workshop attendees are not aware of the full range of alternatives) or one or two options (the already preferred option) is at a far higher level of understanding than the others.
This rather superficial approach to generating options can be improved significantly by adopting enhanced brainstorming methods. We have found that using some tools from Triz (a Russian problem solving method) is a huge advantage. We have also developed a standard "Options Prospectus" that aims to standardise information about each option being used for the evaluation.

Step 2: Criteria

Some key questions for this stage are: What are the criteria? How are they measured?

Value Tree
The factors that contribute to the decision are commonly displayed as a value tree. This summarises all the criteria required. It should not come as a shock to think that different stakeholders may well have different value trees. After all, what they believe contributes to meeting the objective comes from their own experiences and preferences. So why try to create a single value tree that is consensual? We prefer to adopt a process where different stakeholders can have different value trees and this is catered for within the software we use (Smart Decisions). The results are compared with these different value trees later.

The fallacy of consensus
Consider a dinner party. A vegetarian is coming so you prepare some of your normal meat dishes plus a vegetarian option for your guest. You surely would not consider mixing meat with vegetables because that would satisfy both at the same time. In preparing drinks, most might have a glass of wine but the designated drivers might have lemonade. Preparing white wine spritzers for everyone satisfies no-one.
So it is odd that workshops try to get agreement on criteria and weights for factor that might have just as different values as the dinner party.

Criteria
The process of converting the units of a factor to dimensionless ones we call "value mapping". Basically, the units of the factor on the x-axis are plotted and it is then determined where on a 0-100 scale (y-axis) you can place a value. It is very obvious that some factors do not have a straight line. An s-curve is often more appropriate. Clearly, mapping units against 0-100 is a difficult task in a spreadsheet, but professional software does this automatically. The value map is created and when scoring, the software will automatically calculate the mapped value. Different stakeholders may score the same criteria (in name) with different units and/or may have the same units but value them differently.

Step 3: Weighting

The key question for this stage is: What is the balance of scale lengths for each of the criteria?

This process is similar in concept to currency exchange rates. So if one scale is GBP, another is USD and a third is EUR you find that 100 GBP is the equivalent of 125 USD or 117 EUR.
Unfortunately, almost everybody believes weighting is related to importance whereas this is not the case. A GBP is not more or less important that a USD – it just has a different equivalence.
We, at Cogentus, always use swing weighting to compare scales and the software we use (Smart Decisions), has a very user friendly display to compare criteria.

Step 4: Scoring

Some key questions for this stage are: How do you know the score? Where is the evidence?

The traditional approach of experts scoring options is one step that is one of the weakest in the process. Evidence for the scores is rarely provided; the expert's opinion is good enough. There are many reasons why experts are not quite as expert as might be thought. One, an expert is only expert in their particular field. This is often very narrow. So why would they be considered expert enough to score on criteria that is outside of their field? They might be experienced, old or wise but that doesn't necessarily mean they are correct. Second, and crucial, is Groupthink. The powerful tend to dominate and force through their own thoughts, with disagreement seen as not being part of the team. The end result is that the result is the one they always wanted. Third, experienced participants can game the system and that is particularly easy when using a simple 0-5 scale based on opinion.
We, have moved away from "Scoring Workshops" and prefer to collect the scores via datasheets. Each criteria is scored by people who are experts in that particular factor with their reasoning and underpinning evidence provided. The "Scoring Workshop" is then not about the scores but about whether the evidence is robust enough and assumptions used are credible. The scores are the scores.

Step 5: Results / Sensitivity Analysis

Some key questions for this stage are: What has "won". How sensitive is the result to variables?

Almost every element of the process has variables. Different stakeholders might have different value trees, different measures, different value mapping or different weights. The scores themselves are likely to have ranges associated with them. All of these must be considered in carrying out sensitivity analysis.
A spreadsheet is not a feasible tool for this and professional software will help to analyse these automatically. Graphical displays are particularly useful to highlight differences and help to form the arguments regarding robustness.

Conclusions and Recommendations

MCDA is a widely-used process that many people who are participants know little about. They assume the simple method being followed is scientific, yet it rarely is.
To improve the process does not require any more effort, time or cost. It just requires more careful thought at each step. Creating options, creating criteria, weighting, scoring and carrying out sensitivity analysis are all steps that can be significantly improved by enhanced brainstorming and more critical thinking about the underlying mathematics behind MCDA.
The terms consensus decision making does not mean getting people to agree on criteria, weights and scores.
The differences in stakeholders are to be embraced and it is these differences that form the majority of sensitivity analysis.
Finally, the use of spreadsheets for carrying out the mathematics is to be avoided. Professional MCDA software such as Smart Decisions make a significant difference in speed, accuracy and robustness with its imbedded improvements.

About Cogentus

We are a small business based in Reading, UK with offices in Washington DC. We provide products and services for technical problem solving that includes problem definition, ideation and evaluation. We have developed our own software called Smart Decisions that, we believe, is the class leading software for MCDA. It has incorporated many lessons learned from our client work and these features – not available in other software – provides a significantly more robust analysis than is possible with a spreadsheet. We have also developed a suite of technology databases called Ideas Catalog that were developed as a response to what we felt were weaknesses at the options stage.
We use both these tools in delivering to our clients, particularly in workshop-based activities. We have integrated a range of tools and methods that, we believe, are innovative, immersive and impressive.
For further information on MCDA and our approaches, we have recently published a textbook called "Successful Problem Solving". This is available from Amazon or the Cogentus website. www.cogentus.co.uk

About the 85th Meeting

The 85th Meeting of European Working Group on Multicriteria Decision Aiding (EWG-MCDA) was hosted by the Department of Civil, Environmental and Architectural Engineering at the University of Padova, Italy, between April 20th and April 22nd 2017.

Under the theme of "Sustainability Energy and the Environment", the meeting covered research issues in the area of multiple criteria decision aiding, involving new theoretical research and applications. In accordance with this topic, we invite you to contribute papers that discuss new theoretical and methodological developments and their possible applications, as well as papers on practical applications of new methods, application of MCDA in new and innovative areas and case studies.
The level of interest in this spring conference was excellent. We received more than 70 submissions with many authors interested in presenting their research: 18 papers were selected for presentation and 45 were included in the program as papers submitted to discussion. Presentations were organized into five sessions: two session on Theory and Methodology, one session on Energy, one session Social Applications, one session on Sustainability and the Environment.
We welcomed 74 participants representing 48 universities and organizations from 21 different countries and we were honored to welcome Bernard Roy, honorary chairmen of the group.
A scientific highlight of the meeting was the keynote lecture on Friday morning by Daniel Vanderpooten from LAMSADE and Université Paris Dauphine on "Multiobjective Combinatorial Optimization".
As per tradition, participants received a peek at the next venue and exciting activities planned for the 86th and 87th edition of the EWG MCDA meeting to be held in Paris, France and Delft, The Netherlands, respectively.
Day 1 of the conference concluded with the gala dinner at Caffè Pedrocchi, one of the most famous Italian literary café and one of the most historic locations in Padova. Participants had the opportunity to relax and network with other members of the community while enjoying the Hall Napoleon dedicated to Gioacchino Rossini and the Museum of the Risorgimento and tasting a menu with typical and traditional local products.
Day 3 of the conference participants enjoyed a guided tour of some of Padova's tourist highlights including the Cappella degli Scrovegni, the medieval city center, Palazzo Bo and the Anatomical Theatre and Saint Antony Basilica and the Botanical Garden.
We hope that the high scientific quality of all papers, and the intense and lively discussion during the sessions and the

coffee breaks, made the workshop a successful and fruitful event. We also hope the participant enjoyed their stay in Padova.

Our gratitude goes to the keynote speaker, the session chairs and to the participants actively contributing to the conference through their papers, presentations and discussions. We sincerely thank the members of the Scientific Committee for their help in the reviewing process.

We look forward to see all of you in Paris.

Chiara D'Alpaos DICEA – University of Padova
May 2017

PROGRAMME

Thursday April 20

12:00-13:30 Registration of participants. Light lunch
13:30-14:00 Opening and welcome address

14:00-16:00 *Session 1*. THEORY AND METHODOLOGY
Chair: Roman Slowinski

- *Fernandez E., Figueira J.R., Navarro J., Roy B.:* ELECTRE TRI-nB: A new multiple criteria ordinal classification method
- *Abastante F., Corrente S., Greco S., Lami I.M., Ishizaka A.*: Using a new parsimonious AHP methodology combined with the Choquet integral: an application for evaluating social housing initiatives
- *Colorni A., Tsoukiàs A.*: Generating alternatives before evaluating them

Papers submitted to discussion

- *Bagheri N., Ben Abdelaziz F., Rao A.*: A Multiple Goal Programming Approach for the Islamic Portfolio Selection
- *Barbati M., Greco S., Kadzinski M., Slowinski R.*: Optimization of Multiple Satisfaction Levels in Portfolio Decision Analysis
- *Costa A.S., Figueira J.R., Borbinha J.*: A Multiple Criteria Nominal Classification Method
- *Genc T., Filipe J.A.:* Evaluating the Tourism Destinations in Portugal with a Fuzzy Decision Making Method
- *Ogryczak W.*: Lexicographic Max-Min and Related Compensatory Models for Fair Multiple Criteria Optimization
- *Oppio A., Ferretti V., Colorni A., Luè A.***:** Generating combinations of actions for urban regeneration: a Decision Analysis approach
- *Rezaei J.*: Anchoring bias in multi-criteria weighting methods
- *Zouache J., Ben Abdelaziz F.*: Multi-objective moth flame optimization for feature selection

16:00-16:30 Coffee Break

16:30-18:00 *Session 2*, ENERGY
Chair: Milosz Kadziński

- *Angelopoulos D., Siskos Y., Psarras J.*: Disaggregating time series on multiple criteria for robust forecasting: The case of long-term electricity demand in Greece
- *Fraga E.S., Amusat O.O., Shearing P.*: Decision support for the design of integrated renewable off-grid energy systems for continuous large scale mining operations

Papers submitted to discussion

- *Banzato D., Canesi R., D'Alpaos C.*: A hierarchical approach to RES incentive design in Italy: biogas or biomethane?
- *Bilbao Terol A., Arenas Parra M., Cañal Fernández V., Alvarez Otero S.:* A TOPSIS based on Prospect Theory to assess Corporate Sustainability
- *Bonifaci P., Copiello S.*: A Multi-Actor Multi-Criteria Analysis Of Building Energy Policies
- *Bottero M., Figueira J.R., Greco S., Napoli G.*: An MCDA sorting model for addressing energy retrofit operations for public buildings
- *Brauers W.K.M., Zavadskas E.K.:* Engineering and the Environment. Some applications of Multi-Objective Optimization in Engineering
- *D'Alpaos C., Bragolusi P.*: Multicriteria Approaches to Buildings Energy Retrofit
- *Greco S., Ishizaka A., Matarazzo B., Resce G., Torrisi G.*: Composite indices of Well-Being and Stochastic Multiattribute Acceptability Analysis
- *Shmelev S.E.*: Multidimensional Benchmarking for Smart and Sustainable Megacities: from London to Singapore

20:00 Banquet at Caffè Pedrocchi

Friday April 21

09:00-11:00 *Session 3*. SOCIAL APPLICATIONS
Chair: Marc Pirlot

- *Norese M.F.*: Social innovation and MCDA
- *Sato Y.*: Sustainable Social Structure, a New Public
- *Becchio C., Corgnati S., Bertoncini M., Boggio A., Bottero M., Dell'Anna F.:* Post-Carbon Buildings to design a Post-Carbon City. An application of the PROMETHEE method for the comparison of energy requalification strategies at the district level
- *Dell'Ovo M., Asfora Frej E., Oppio A., Capolongo S., Costa Morais D., Teixeira de Almeida A.:* Sustainable decision for the location of healthcare facilities using FITradeoff method

Papers submitted to discussion

- *Fancello G., Tsoukiàs A.*: Designing decision maps. Subjective values in spatial analysis for policy-making processes
- *Fernández Barberis G., del Carmen García Centeno Mª, del Carmen Escribano Mª:* Analysis of Economic Freedom in Europe: A multi-criteria approach
- *Garengo P., Sardi A., Trotta D., Jardioui M.*: Decision making and national culture: an empirical study of Italian, Indian and Moroccan SMEs
- *Mangialardo A., Micelli E.*: Demolish or reuse the existing city? An AHP application to support the Italian Local Authorities decisions
- *Marleau-Donais F., Abi-Zeid I., Lavoie R.*: Facilitating Group Decision Making – Challenges and Solutions
- *Petrillo A., De Felice F., D'Alpaos C., Canesi R.*: Using multiple criteria decision analysis to estimate real estate investment
- *Mebrek A., Mendas A., Saidi A.*: Integration of MCDA in GIS to develop green spaces
- *Romagnoli F., Toseroni F., Marincioni F., Feofilovs M.*: A multi-criteria based approach toward the evaluation of the territorial Disaster Resilience using a Pressure and Release (PAR) model
- *Sardi A., Trotta D., Garengo P.*: Social media and decision making process in SMEs: empirical studies of leading organizations
- *Stamenković M.*: Modeling public policy decisions – MCDA based stepwise benchmarking model

11:00-11:30 Coffee Break

11:30-12:30 *Keynote Lecture*, Chair: José Rui Figueira
Daniel Vanderpooten: Multiobjective Combinatorial Optimization

12:30-14:00 Lunch
14:00-14:30 Preparation of next meetings/ Vie du groupe

14:30-16:00 *Session 4*. SUSTAINABILITY AND ENVIRONMENT
Chair: Fouad Ben Abdelaziz

- *Giove S., Pham V.*: Application of Multi-Criteria Decision Analysis (MCDA) methods in the evaluation of ecosystem services (ES) in the context of climate change
- *Agarski B., Budak I., Simunovic G., Kosec B., Vukelic D.*: Evaluation of eco-design alternatives through integrating life cycle impact assessment and multi-criteria decision aiding
- *Rocchi L.; Paolotti L., Fiume Fagioli F.*: Using LCA, LCC and MCDA for sustainability evaluation of insulating materials

Papers submitted to discussion

- *Ben Abdelaziz F., Alaya H., Kumar Dey P.*: A Multiobjective Algorithm for Sustainability Analysis: A Comparative Analysis between French and UK companies
- *Ben Amor S., Frini A., Guitouni A.*: Towards a Multi-Criteria Framework for Corporate Sustainability Assessment
- *Ben Brahim Neji H., Horriche F., Slama F.*: Multicriteria decision aid for choosing groundwater artificial recharge sites with treated wastewater: Case study of the Mornag aquifer
- *Cerreta M., Mele R., Poli G.*: Landscape Services Assessment: A Hybrid Multi-Criteria Decision Making Approach for the Metropolitan City of Naples (Italy)
- *D'Alpaos C., Valluzzi M.R., Canesi R., Pezzolo A.*: Post-Earthquake Intervention Prioritization in Cultural and Artistic Heritage
- *Frini A., Urli B., Benamor, S.*: A multi-criteria multi-period outranking method for sustainable project selection under uncertainty
- *Hajderi A., Kosova R.*: Pollution caused by vehicles in Tirana city and tasks to reduce it
- *Kannan D.*: Sustainable Procurement: A review to conceptual framework
- *Kosova R., Prifti I., Muçeku B.:* Using multi-criteria decision analysis to evaluate and choose the municipal waste landfill sites. A case study in Albania
- *Macary F.*: Assessment of agricultural practices to reduce pesticides in the vineyard of Bordeaux, using a multiple criteria decision aid method
- *Nivolianitou Z.*, Gyftakis S., Papazoglou I.A., Georgiadou P.: A Land Using Planning Tool in Areas of Industrial Hazards

16:00-16:30 Coffee Break

16:30-18:30 *Session 5*. THEORY AND METHODOLOGY
Chair: Salvatore Greco

- *te Boveldt G., Van Raemdonck K., Macharis C.:* Making multi-actor multi-level decisions with Competence-based Multi Criteria Analysis
- *Ghaderi M., Agell N., Ruiz F.*: Does logo color matter in perceptions of beauty and care brands?
- *Giarlotta A., Watson S.*: Well-graded families of NaP-preferences
- *Lahdelma R., Loikkanen O., Salminen P.*: Multicriteria Evaluation of Sustainable Energy Solutions for Colosseum

Papers submitted to discussion

- *Abastante F., Lombardi P., Toniolo J.,Torabi Moghadam S.:* A Participative Multicriteria Decision Aiding Approach for delivering Urban Energy Retrofitting Scenarios

- *Angilella S., Mazzù S.*: Performing a sensitivity analysis on Italian innovative SMEs' creditworthiness
- *Arcidiacono S.G. Corrente S., Greco S.*: Using PROMETHEE method for ranking universities taking into account robustness concerns and a hierarchy of interacting criteria
- *Bagherikahvarin M.*: A DEA-PROMETHEE approach for complete ranking of units
- *Cardin M., Giove S., Greco S.*: A costructive multiple criteria decision aiding approach for bibliometric evaluations
- *Huttin C.*: A joint estimation using stated and revealed preference models for health care budgets: milestones for model development
- *Kadziński M., Govindan K., Sivakumar R.*: Application of a novel PROMETHEE-based method for construction of a group compromise ranking to prioritization of green suppliers in food supply chain
- *Trotta D., Garengo P., Sardi A.*: How decision making in Industry 4.0 environment is changing the management of human resources: an empirical study on manufacturing companies
- *Zabeo A., Hristozov D., Semenzin E., Pizzol L., Subramanian V., Basei G., Marcomini A.*: SUNDS, a MCDA based nanotechnology sustainability Decision Support System

18:30 Conclusion

Forthcoming meetings

- 11-12/5/2017

PROMETHEE days 2017
Portsmouth, UK
http://www.port.ac.uk/promethee

- 30/5-1/6/2017

CMS2017 Computational Management Science
Bergamo, Italy
http://dinamico2.unibg.it/cms2017/index.htm

- 5-8/6/2017

CEC-2017 - IEEE Congress on Evolutionary Computation
San Sebastian, Spain
http://www.cec2017.org

- 12-15/6/2017

EWEPA - 15th European Workshop on Efficiency and Productivity Analysis
London, United Kingdom
http://ewepa.org/conferences/london2017/

- 19-21/6/ 2017

26th Annual Conference/Meeting of the Society for Risk Analysis – Europe
Lisbon, Portugal
https://sraelisbon2017.wordpress.com/

- 26-29/6/2017

15th International Conference on Data Envelopment Analysis
Prague, Czech Republic
http://deaconference.com/dea2017

- 28-30/6/2017

Congress of the Portuguese Operations Research - IO 2017
Valença, Portugal
http://apdio.pt/en/web/io2017/home

- 4-7/7/2017

12th Metaheuristics International Conference (MIC 2017)
Barcelona
http://mic2017.upf.edu/

- 9-14/7/2017

ISOLDE XIV (International Symposium on Locational Decisions)
Toronto, Canada
http://inside.rotman.utoronto.ca/ISOLDE/

- 10-14/7/2017

24th International Conference on Multiple Criteria Decision Making - MCDM 2017
Ottawa, Canada
http://sites.telfer.uottawa.ca/mcdm2017/

- 15-19/7/2017

GECCO 2017 - Genetic and Evolutionary Computation Conference
Berlin, Germany
http://gecco-2017.sigevo.org/

- 17-21/7/2017

28th IFIP TC7 Conference 2017 on System Modelling and Optimization
Ankara, Turkey
http://iam.metu.edu.tr/ifip17

- 17-21/7/2017

IFORS 2017
Québec City, Canada
http://ifors2017.ca/

- 14-16/8/2017

MOPTA 2017
Lehigh University, Bethlehem, PA, USA
http://coral.ie.lehigh.edu/~mopta/

- 19-22/9/2017

11th International Conference on Parametric Optimization and Related Topics (ParaoptXI)
Charles University, Prague, Czech Republic
http://paraoptxi.fsv.cuni.cz

- 6-8/9/2017

Optimization 2017
Lisbon, Portugal
http://optimization2017.fc.ul.pt

- 6-8/9/2017

OR 2017 International Annual Meeting of the German OR Society (GOR)
Berlin, Germany
http://www.or2017.de/

- 14-17/9/2017

3rd Int. Workshop on Machine learning, Optimization & big Data - MOD 2017
Volterra, Tuscany, Italy
http://www.taosciences.it/mod/

- **21-23/9/2017**

86th Meeting of EURO Working Group on MCDA
Paris, France
http://www.cs.put.poznan.pl/ewgmcda/

- 22-25/10/2017

2017 INFORMS Annual Meeting
Houston, Texas, USA
http://meetings2.informs.org/wordpress/houston2017/

- 27-29/9/2017

SOR '17 - The 14th International Symposium on Operations Research in Slovenia
Bled, Slovenia
http://http://sor17.fov.uni-mb.si/

- 25-27/10/2017

ADT 2017 - 5th International Conference on Algorithmic Decision Theory
Luxembourg
http://sma.uni.lu/adt2017

- 1-3/11/2017

IJCCI - 9th International Joint Conference on Computational Intelligence
Funchal, Madeira, Portugal
http://www.ijcci.org/

- 15-17/11/2017

IES 2017 - 21st Asia Pacific Symposium on Intelligent and Evolutionary Systems
Hanoi, Vietnam
http://fit.lqdtu.edu.vn/ies2017

- 10-13/12/2017

IEEM2017 - IEEE International Conference on Industrial Engineering and Engineering Management
Singapore
http://www.IEEM.org

- 25-27/1/2018

WGSCO2018 - Workshop on Graph Spectra, Combinatorics and Optimization
Aveiro, Portugal
http://wgsco2018.web.ua.pt

- **April 2018**

87th Meeting of EURO Working Group on MCDA
Delft, The Netherlands
http://www.cs.put.poznan.pl/ewgmcda/

- 8-11/7/2018

EURO 2018
Valencia, Spain

- 23-26/6/2019

EURO 2019
Dublin, Ireland

Seminars

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

Responsables : Bernard ROY, Daniel VANDERPOOTEN
(le mardi à 14h00 – salles à préciser)

Prochaines réunions
30 mai 2017 Conférence de **Sébastien Adam**
LITIS, Université de Rouen
Apprentissage multi-objectifs dans l'espace ROC Problème de gestion de production électrique à court-terme dans les vallées hydrauliques

20 juin 2017 Conférence de **Xavier Schepler**
Université d'Angers
Ordonnancement robuste de lignes d'assemblage avec stations parallèles

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

Announcements and Call for Papers

By Prof Zopounidis

2018 MCDA/MCDM Summer School Chania, Greece

The 13rd International MCDA/M Summer School is going to take place in Chania/Greece, tentatively, during July 23-Augut 3, 2018. Details are available at http://www.mcda-school18.tuc.gr

The aim of this school is to give to doctoral students/young researchers a state-of-the-art presentation of multiple criteria methods, applications and software. Moreover, the school seeks to stimulate a network of young researchers in MCDA/M. The scientific program of the summer school consists of invited lectures and working groups for discussion of case studies.

The host institutions will be the Technical University of Crete and the Mediterranean Agronomic Institute of Chania (MAICH) and the venue will be the Conference Center of MAICH.
The city of Chania lies on the northwest coastline of the island of Crete. Being the largest of Greek islands, Crete has a significant contribution to the Greek economy and it is a major tourism and business center in the east Mediterranean region. Chania is the second largest city in Crete with a population of more than 100,000 inhabitants. Due to its natural beauty and variety of sights, Chania is among the leading tourist destinations not only in Greece but also in the whole Mediterranean area. International conferences are often held in Chania, usually in areas related to engineering, management, and economics. Chania also hosts several educational and research facilities, including the Technical University of Crete (one of the leading Greek universities in terms of research output) and MAICh (an intergovernmental research organization, member of the International Centre for Advanced Mediterranean Agronomic Studies).
The International Airport of Chania has direct charter and scheduled flights to many European cities. Multiple daily domestic flights also connect Chania with Athens, which is directly connected to all major international hubs.
We will provide further information and invite applications in future. For now, make a note of the dates and wait for further announcements. We are looking forward to seeing you in MCDA/M Summer School in Chania, July 2018.

By Dr Valentina Ferretti

Valentina Ferretti has been invited to teach a course about Spatial MCDA at the University of Trento in September: http://events.unitn.it/en/smca2017.

By Prof Daniel Morais

Call for papers: Mathematical Problems in Engineering
[2015 JCR Impact Factor: 0.644]

Special Issue: Building Mathematical Models for Multicriteria and Multiobjective Applications 2017

In our daily lives or professional settings, there are many decision problems that involve multiple criteria, which may be conflicting and incommensurable. The complexity of real-world decision and the plethora of factors and criteria that are often involved necessitate the implementation of a sound theoretical framework to structure and model the decision-making process. Methods of Multiple Criteria Decision Making/Aid (MCDM/A) can be applied to support decision makers (DMs) in such task. MCDM/A provides such a framework, as well as a wide variety of methodological tools that are oriented towards the support of the DMs in facing real-world decision problems. Applications in a variety of areas may be done by building decision models representing both the preferences of decision makers and the various characteristics of the problems at hand, which may include the aggregation of DMs in group decision making (GDM). These built decision models are the basis for applications in a diversity of areas supporting DMs for handling those problems.

The aim of this special issue is to promote and disseminate research and applications among academics and other professionals interested in theory, methodologies, and applications of MCDM/A.

This special issue is aligned with the mission of the MPE and seeks bringing high-quality papers with significant impact on the practice of business, management, and policy making utilizing MCDM/A.

Authors are welcome to submit papers that consider mathematical models for and applications of multicriteria and multiobjective methods. Final applications could be related to, or consider, but are not limited to, the following topics: energy, environment, climate, sustainability, risk management, reliability, maintenance, project management, production management, supply chain management, logistic, location, transportation, and healthcare.

Potential topics include, but are not limited to:

- Preference modeling and risk and uncertainty modeling
- Behavioral issues for building MCDM/A and GDM models
- GDM and negotiations models
- Building of multicriteria group decision models
- Building mathematical models with multiattribute utility or value theory (MAUT/MAVT)
- Building mathematical models for MCDM/A with partial information
- Building mathematical models based on multiobjective optimization and multiobjective combinatorial optimization
- Use of evolutionary algorithms in MCDM/A
- New areas of MCDM/A in applied outranking methods
- Building mathematical models with fuzzy MCDM/A
- Advanced applications of AHP (Analytical Hierarchical Process) and ANP (Analytical Network Process)

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By prof Hatem Masri

I am honored to invite you to the 12th International Conferences on Multiple Objective Programming and Goal Programming (**MOPGP 2017**) that will take place in Metz, France from 30 to 31 October 2017. This conference is a forum within which researchers and practitioners can meet and learn from each other about recent development in Multiple Objective Programming and Goal Programming. Amongst the participants are academicians and practitioners whose common interest is in multiple objective decision analysis.
Please submit abstracts online at: https://easychair.org/conferences/?conf=mopgp2017
Selected extended-abstracts will be considered as potential full-paper publications, subject to peer reviews in Annals of Operations Research.
The deadlines are the following:

- Submission of abstracts: June 15, 2017
- Acceptance notice: June 30, 2017

For more information please visit the conference website http://mopgp.org/
We are looking forward to welcoming you in the beautiful city of Metz next October!
Best regards

Hatem Masri
Member of the steering committee
Director of the Quality Assurance and Accreditation Office, University of Bahrain, Bahrain

Books

Multiple Criteria Decision Making: Applications in Management and Engineering

Constantin **Zopounidis**, Michael **Doumpos** (Eds)

Springer, 2017
ISBN 978-3-319-39292-9

http://www.springer.com/in/book/9783319392905

Presents a broad range of new multiple criteria decision making (MCDM) applications in management and engineering. Covers all main methodological streams in MCDM. Presents hybrid and integrated techniques combining MCDM with other analytical disciplines.

Multicriteria and Clustering: Classification Techniques in Agrifood and Environment

Zacharoula **Andreopoulou**, Christiana **Koliouska**, Constantin **Zopounidis** (Eds)

Springer, 2017
ISBN 978-3-319-55565-2

http://www.springer.com/gp/book/9783319555645

This book provides an introduction to operational research methods and their application in the agrifood and environmental sectors. It explains the need for multicriteria decision analysis and teaches users how to use recent advances in multicriteria and clustering classification techniques in practice. Further, it presents some of the most common methodologies for statistical analysis and mathematical modeling, and discusses in detail ten examples that explain and show "hands-on" how operational research can be used in key decision-making processes at enterprises in the agricultural food and environmental industries. As such, the book offers a valuable resource especially well suited as a textbook for postgraduate courses.

Multi-Criteria Decision Analysis to Support Healthcare Decisions

K. **Marsh**, M. **Goetghebeur**, P. **Thokala**, R. **Baltussen** (Eds.)

Springer, 2017
ISBN 978-3-319-47540-0

http://www.springer.com/us/book/9783319475387

Representing the first collection on the topic, this book builds from foundations to case studies, to future prospects, providing the reader with a rich and comprehensive understanding of the use of multi-criteria decision analysis (MCDA) in healthcare. The first section of the collection presents the foundations of MCDA as it is applied to healthcare decisions, providing guidance on the ethical and theoretical underpinnings of MCDA and how to select MCDA methods appropriate to different decision settings. Section two comprises a collection of case studies spanning the decision continuum, including portfolio development, benefit–risk assessment, health technology assessment, priority setting, resource optimisation, clinical practice and shared decision making. Section three explores future directions in the application of MCDA to healthcare and identifies opportunities for further research to support these.

Multi-Criteria Decision Making for the Management of Complex Systems

Albert **Voronin**

IGI Global, 2017
ISBN 978-1-522-52509-7

Provides a comprehensive examination of the latest strategies and methods involved in decision theory. Featuring extensive coverage on relevant topics such as nested scalar convolutions, Pareto optimality, nonlinear schemes, and operator performance, this publication is ideally designed for engineers, students, professionals, academics, and researchers seeking innovative perspectives on the supervision of advanced decision making theories in system analysis.

Articles Harvest

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

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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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