Opinion Makers Section

MCDA and sustainability

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1. Introduction

In the last three decades words as sustainability, sustainable or sustainable development, have become more and more familiar, both to decision makers and to ordinary citizens. The general awareness that the current development model is taking a wrong direction plays its role. For researchers, the key challenge consists in contributing to measure, drive and correct this development model. In this context, multicriteria decision approach is one of the instruments useful for reaching this aim.

Sustainability is a multidimensional concept: economic, social and environmental aspects must be considered and integrated, following the so called Triple Bottom Line approach, where the three pillars have to be taken into account (Pope et al., 2004). How to make the integration and how to measure the degree of sustainability are among the most important issues in the field, due to the non comparability of the three dimensions and to the problem of compensation among pillars.

In the report "Our Common Future" (1987) or Brundtland Report, sustainable development is defined as "development which meets the needs of the present without compromising the ability of future generations to meet their own needs". Those who studied this issue have concluded that a sustainable and lasting development is possible only if the planning, organization and management of resources is based not only on the traditional factors of "fixed capital" and "work" but also on natural capital.

In formulating his economic theory of sustainable development, Herman Daly pointed out that there are two main principles of sustainability in the management of resources (Daly, 1996):
1. the speed at which the resources are used must be equal to their capacity to be regenerated;

2. the speed of production of waste must be equal to the capacity of absorption by the ecosystems into which the waste is put.

The capacity to regenerate and absorb must be treated as "natural capital": if this capacity cannot be maintained, the capital will be used up and sustainability is no longer possible.

Daly added that there are two ways of keeping total capital intact:

1. Weak sustainability: this means keeping the sum "natural capital + capital produced by man" at a constant value. The material or human capital (i.e. infrastructure, labor, knowledge, etc.) and the natural capital (i.e. biodiversity, ecosystem services, natural resources, etc.) can replace each other. A "welfare package" consisting of a constant sum of material capital plus natural capital must be handed down to the future generations. The weak sustainability paradigm was developed principally upon the work of Solow (1974; 1986; 1993) and Hartwick (1977; 1978a; 1978b).

2. Strong sustainability: This means keeping each component at a constant value. The material capital and the natural capital are not interchangeable. Both capitals must be maintained intact, since the productivity of one depends on the availability of the other. Replacing natural capital with material capital is only possible to a very limited extent. The earth and its resources are assigned to each generation as trustees, and each generation has the duty to leave nature "intact" (constant natural capital) to the next generation, whatever the level of well-being reached may be.

It is already clear by looking at the two definitions of strong and weak sustainability, that measuring sustainability itself is strictly connected to the way in which the three pillars are joined. The contrast between strong and weak sustainability is

still under discussion (Cabeza Gutés M., 1996; Neumayer E., 2004; Hector et al., 2014; Ang and van Passel, 2014); however, the concept of strong sustainability is closer to true sustainability (van den Bergh J., 2007). Using the strong paradigm, social, economic and environmental aspects are integrated, although they retain their own independence.

2. Sustainability & MCDA

The Ecological Economics approach is particularly suitable for the interpretation and assessment of many aspects involved in sustainability assessment (Rees, 2003), due to its major complexity in comparison with the neoclassical model. (Venkatachalam, 2007; Christensen P., 1991; Costanza R. et al., 1991). Indeed, in this context, assessment procedures must be able to interpret and evaluate many different aspects. It is necessary to link economic evaluations with biological, ecological and social ones, as for example the concept of Complex Social Value (CSV) does in its assessment of public goods. Therefore, in the Ecological Economics Approach, the assessment is no longer based on a single monetary indicator but on a set of indicators, some of which are monetary and others non-monetary. The concept of incommensurability of values, considered a foundation stone for Ecological Economics, is taken into account (Martinez-Alier et al., 1998). This is why multi-criteria assessment methodologies assume a central role in the multidimensional sustainability evaluation process. Multi-criteria analyses are useful to solve complex problems by assessing all the variables, both individually and collectively, assigning specific importance to each variable. Thus, multi-criteria methodologies have been widely used to evaluate sustainability (Liu, 2007; Shmelev and Labajos-Rodrigues, 2009, Rowley et al., 2012; Herva and Roca, 2013).

The appropriate instrument for a multidimensional representation of a certain reality is a suitable set of indicators that must be an integral part of an assessment methodology to be used for the purposes of measuring sustainability (Ness et al., 2007; Moffat et al., 2001). Improvements in the way the indicators are constructed and used is a very important research issue (Munda and Nardo, 2009).

Since multicriteria evaluation is for its intrinsic nature multidimensional, it allows researchers to take into account economic, social and environmental interactions. The use of weak or strong sustainability concept depends on the degree of compensability allowed by the aggregation procedure (Martinez-Alier et al., 1998). In general, there are two possibilities: to aggregate or to not aggregate the three dimensions into a single indicator

(Ness et al., 2007). However, choosing the second option means to give information about the single importance of each attribute, but without giving an overall framework. At the contrary, aggregating the three dimensions into a unique "Sustainability index" allows a comprehensive evaluation. The way of aggregation may differ largely. Some indices used in the Ecological Economics field aggregate all the three dimensions, with no additional information about the weight and role of each pillar. Such approach is very close to the concept of weak sustainability, due to the compensation that is generated among the social, economic and the environmental aspects. This is precisely what was made in the UN "Dashboard of Sustainability", created in the framework of the United Nations Commission on Sustainable Development (UNCSD), subsequently improved by a small group of researchers led by the International Institute for Sustainable Development (Canada), and presented at the World Summit in Johannesburg in 2002. The Dashboard of Sustainability, combining the economic, social and environmental aspects, provided a picture of the level of sustainable development at national, regional, provincial and municipal level. In this way, it was possible to obtain an overall index of sustainability called ESI (Environmental Sustainability Index). However, due to extreme aggregation of the information, the interpretation and the understanding of the results when using this index is very difficult; as a matter of fact the "Dashboard" has been defined a "black box", because there is no way of knowing exactly what happens inside the box: in other words how the data are processed. Another option is to put together two dimensions and left the third stand alone (Boggia and Cortina, 2010). Usually, in this case the two pillars mixed together are the social and economic dimensions, while the environmental one is separated. This approach can be useful in case of evaluation at municipality level, or similar, where socio and economic data are few to be treated separated (Boggia and Cortina, 2010). The third solution is to maintain separated all the three dimensions in the construction of the index. Although there is the possibility to have a unique value, at the same time it is possible to have the contribution of each single component.

Using multicriteria decision approach allows to have all the three types of indices. The MCDA methods allow for different degrees of compensation, according to the different aggregation procedure applied. The methods which assume a complete compensation among criteria (e.g. MAUT and AHP) are able to manage only the weak paradigm of sustainability (Cinelli et al., 2014). These methods produce a single score, with no possibility to understand the contribution of each component and, as consequence, the compensation among each pillar. Outranking methods allow for both the paradigms, due to the presence of the thresholds, which can be used to correct the degree of compensation. We can use the same method to analyse different degrees of compensation, and of sustainability, in the same case study (Cinelli et al.,

2014; Massei et al., 2014). Methods based on decision rules theory, as Dominance Based Rough set approach, face perfectly the strong paradigm, since they are perfect "glass box methods".

3. Conclusion

Sustainability has become one fundamental issue to deal with, taken into account at worldwide level by policy makers, citizens, researchers. Multicriteria decision approach is a powerful family of methods in relation to the evaluation of sustainability, and due properly to its multidimensional structure, it allows to consider the three dimensions of sustainability and the interactions among them. In sustainability assessment, MCDA approach is often used to construct synthetic indicators or indices, which can allow a different degree of compensation, depending on the method applied. As a consequence, we can handle both weak and strong sustainability frameworks, according to the Decision Makers needs and objectives. Several applications can be found in literature, while a more comprehensive analysis about possibilities, limits and future development is still a not very well developed field.

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 # MCDA Research Groups

Financial Engineering Laboratory

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The Financial Engineering Laboratory (FEL) of the Technical University of Crete was founded in 1999. Its objective is to provide high-level educational support to under-graduate and graduate students as well as to conduct innovative research on areas related to financial decision making and management.

The current members of the laboratory include:
- Constantin Zopounidis, Professor (Director)
- Emilios Galariotis, Professor
- Michael Doumpos, Associate Professor
- Fotios Pasiouras, Associate Professor
- Kostas Andriosopoulos, Associate Professor
- Chrysovalantis Gaganis, Assistant Professor
- Spyros Papaefthymiou, Assistant Professor
- Georgios Atsalakis, Lecturer

More than 20 research fellows are affiliated with the laboratory from USA, UK, France, Italy, Spain, and Greece. FEL has also established collaborations with a number of research centers, such as:
- The Research Centre for Energy Management (ESCP Europe Business School, UK)
- The Centre for Financial and Risk Management (Audencia Nantes School of Management, France)
- The Centre for Money, Banking, and Institutions (University of Surrey, Business School, UK)
- The Centre for Governance and Regulation (University of Bath, School of Management, UK)
- The Applied Research Group in Finance (Coventry University, Business School, UK)
- The Efficiency and Productivity Research Unit (University of Leicester, School of Management, UK).

FEL also collaborates with the Financial Engineering and Banking Society (FEBS, http://www.febsociety.org), a newly established (since 2010) international research organization, which aims towards the promotion of decision making approaches in the fields of financial engineering and banking. Each of the past three international conferences of FEBS has attracted more than 300 submissions.

FEL conducts theoretical and applied research based on the development and implementation of advanced computational and analytic techniques from the different disciplines,

including operations research, artificial intelligence, and statistics/econometrics. In particular, the laboratory has developed expertise on MCDA techniques (mainly on preference disaggregation approaches and outranking methods), frontier estimation methods (data envelopment analysis and stochastic frontier analysis), machine learning and soft computing techniques (support vector machines, neural networks, neuro fuzzy systems), as well as methods for panel and time-series data.

Some recent research areas and results can be summarized in the following points:

- Credit risk modeling. Credit risk management is a critical issue for financial institutions. The risk assessment for corporate credit granting and consumer loans requires the consideration of a diverse set of factors, including financial and non-financial attributes, quantitative and qualitative. The databases maintained internally by financial institutions or externally by credit rating agencies, constitute a valuable source of information for constructing and validating risk assessment and credit granting models in accordance with the existing regulatory guidelines. FEL has worked extensively in this area, introducing novel MCDA techniques based on value functions and outranking relation models. Special emphasis has been given on improving the predictive performance of existing methods that learn decision models from large scale data, which is of fundamental importance for financial applications such as credit risk assessment. In particular, new linear programming models have been developed to infer robust additive value functions for credit scoring, whereas are evolutionary techniques have been used for model complex models (e.g., outranking relations). In this area, FEL has collaborated with ICAP SA, a leading Greek business services group to develop and validate corporate credit scoring models. Similar collaborations have also been established with Greek banks.

- Banking management and efficiency analysis. Banking management entails many different aspects of bank operations, including internal issues (e.g., risk management systems, asset/liability management, network operations, the design and management of financial products, etc.), as well as issues related to the regulatory and supervisory environment. FEL has employed MCDA techniques for assessing the performance of banks, together with popular efficiency appraisal techniques to evaluate bank efficiency in an input/output framework. Particular emphasis has also been given to the identification and analysis of the factors that affect and explain the performance and efficiency of banking institutions, in a cross-country context. These include among others the supervisory and regulatory framework, corporate governance

factors, mergers and acquisitions, and the effects of the recent global crisis. Recently, the laboratory has been involved in a project focused on extending the existing bank performance and efficiency assessments considering adverse stress testing scenarios. FEL has also collaborated with the Bank of Greece to develop a multicriteria decision support system for bank risk rating.

- Portfolio optimization and management. Investing in financial markets is a complex process that comprises asset selection, portfolio construction, and rebalancing/trading. The research conducted at FEL as mostly focused on the first two stages. At the asset selection stage, the research at FEL is mostly oriented towards using MCDA methods for evaluating the fundamentals of financial assets and market conditions. This type of approach is best suited for medium and long-term investments, including both equities and mutual funds. Different MCDA models and techniques have been employed in this context, including value models, outranking relations, rule-based techniques, and preference disaggregation approaches. Short-term investments, on the other hand, are mostly based on technical analysis rules and return/price prediction models. FEL is working on that direction using soft computing techniques. On the portfolio construction phase, FEL has development and implemented multi-objective and goal-programming models, using traditional risk-return criteria, as well as new risk measures and other considerations (liquidity, dividends, cardinality constraints, etc.). To facilitate the implementation of such techniques, multi-criteria decision support systems have been developed. Furthermore, the portfolio optimization framework has also been considered in the context of index replication strategies using evolutionary optimization techniques.

- Commodity and energy markets. Over the past couple of decades, commodity and energy markets have gained much interest among researchers in finance, practitioners, and policy makers. The growth of these markets provides new opportunities for firms in different sectors (industry, transport, food and agriculture, etc.), but also creates major challenging due to complexity of the financial derivative products traded in the markets and complexity of the financial and non-financial factors that drive these markets. The research at FEL on this domain involves the adaptation of models from traditional financial markets for portfolio management in the commodity and energy markets, together with the application of intelligent and econometric techniques for forecasting purposes, and frontier methods for country-wise energy efficiency analysis.

Other areas covered by the research conducted at FEL include mergers and acquisitions, venture capital investments, and auditing as well as other topics in the field of management science, such as customer relationship management, corporate

governance and corporate social responsibility, and public services.

The members of FEL have authored and edited more than 100 books and 400 research papers in leading international journals and they are actively involved in the publication of several journals (associate editors and members of editorial boards). The research and educational activities of FEL have been funded by grants obtained from the European Union, the Greek Government, and private companies. Furthermore, the Laboratory has organized more than 50 national and international conferences, on financial modeling, risk management, MCDA, and decision support. Among others, FEL has participated in the organization of the 2006 International MCDM conference which was held in Chania-Greece, and the 68th Meeting of the European Working Group on Multicriteria Decision Aid (Chania, 2008).

FEL also maintains an active working paper series, which provides a means of communication on topics related to financial engineering and MCDA. The series publishes articles by members of the laboratory as well as papers from joint projects with visiting scholars and the research fellows of FEL. All articles submitted for publication in the working paper series are refereed by an external reviewer for evaluation and discussion with the authors. Articles appearing in the series may subsequently be submitted for publication to international journals. Those interested in submitting an article for publication in the working paper series of FEL should contact the Editor of the series, Prof. Constantin Zopounidis, at kostas@dpem.tuc.gr.

Further information on the activities of the Laboratory are available at its website: http://www.fel.tuc.gr

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Consultancy Company

Hiérarchisation des actions du second Plan français Santé et Environnement (PNSE2) en vue de son évaluation

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Introduction

Une évaluation du second Plan National Santé et Environnement français (PNSE2, 2009-2013) a été réalisée par un groupe d'experts en 2012. Ceux-ci ont décidé de procéder à une hiérarchisation des actions proposées dans ce plan afin d'en évaluer en détail qu'une partie de celles-ci. Pour ce faire, une analyse multicritère a été pratiquée par le groupe d'experts avec l'appui méthodologique des auteurs du présent article.

Contexte de l'évaluation

Elaboration du PNSE2

Le second plan national santé et environnement (PNSE2) a été adopté par le gouvernement français pour la période 2009-2013, tel que prévu par la Loi française de Santé Publique (LSP, 2004) et conformément aux engagements internationaux pris. Son principal objectif consistait à «

renforcer la cohérence des actions portant sur les effets environnementaux affectant la santé » selon deux grands axes structurants: la réduction des expositions responsables de pathologies à fort impact sur la santé et la prise en compte et la gestion des inégalités environnementales.

Son élaboration a abouti à la création de fiches pour 58 actions regroupées en 16 thématiques touchant les différents aspects de la problématique (Tableau 2 en annexe).

Contexte de l'évaluation du PNSE2

En novembre 2012, la Direction Générale de la Santé (DGS) a demandé au Haut Conseil de la Santé Publique (HCSP) une évaluation du PNSE2 focalisée principalement sur l'atteinte de ses objectifs, à effectuer en coordination avec l'Inspection générale des affaires sociales (IGAS), le Conseil Général de l'Environnement et du Développement Durable (CGEDD), l'Inspection Générale de l'Administration de l'Education Nationale et de la Recherche (IGAENR) et l'Office Parlementaire d'Evaluation des Choix Scientifiques et Technologiques (OPECST).

Cette évaluation devait notamment prendre en compte les objectifs « environnement et travail » prévus par la LSP de 2004 et les améliorations possibles en vue de l'élaboration du PNSE3. La grille d'analyse «Evaluabilité des plans et programmes de santé», élaborée en 2011 par le HCSP, a été utilisée. Cela a permis de préciser, au sein du Comité d'évaluation (Codev) mais aussi avec les commanditaires, les limites de l'exercice d'évaluation, en fonction des caractéristiques mêmes du plan et de la disponibilité des données.

L'évaluation couvrait principalement la période 2008-2012 ou une autre période pertinente, selon la disponibilité des données.

Le Codev, composé de 16 experts, dont 7 extérieurs au HCSP, s'est chargé de l'évaluation. Un comité consultatif, composé d'acteurs concernés par le plan d'action ou sa thématique, a eu pour tâche de valider le travail du Codev, étape par étape.

Faisant le constat de l'impossibilité d'évaluer de manière approfondie et exhaustive l'ensemble des actions du plan dans le temps imparti et avec les ressources disponibles, le Codev a décidé de procéder à une hiérarchisation des 58 actions proposées par le PNSE2 au moyen d'une analyse multicritère, pilotée par les auteurs du présent article. Il s'agissait ainsi de délimiter le périmètre de l'évaluation en procédant à la sélection d'un sous-ensemble d'actions particulièrement «signifiantes».

Analyse multicritère

Actions

Les 58 actions à évaluer sont présentées sommairement dans le Tableau 2 en annexe.

Critères

Les critères de priorisation suivants ont été définis par le Codev:

1. Importance mesurée du sujet, définie par ses enjeux de santé publique.
2. Importance ressenti du sujet, définie par la perception par la population de l'ampleur du problème.
3. Caractère structurant des collaborations requises entre institutions et diverses parties prenantes pour la mise en œuvre du plan.
4. Ampleur et utilité potentielle des connaissances apportées par l'évaluation (dans quelle mesure le processus d'évaluation peut favoriser le système d'information permettant de renseigner les indicateurs pertinents).
5. Utilité / efficacité attendue de l'action (capacité à contribuer à la résolution du problème considéré).

Comme il y avait divergence sur l'interprétation à donner à la définition du critère 4, voire même sur le sens des préférences de ce critère, l'analyse a été réalisée avec et sans ce critère.

Evaluations

Les actions ont été évaluées sur la base de ces cinq critères. Un tableau d'évaluation de base a été élaboré par quelques membres du Codev. Chaque membre a ensuite pu l'adapter, selon ses connaissances. Les auteurs estiment que les différentes adaptations ont porté sur moins de 5% des valeurs du tableau.

De plus, les experts avaient la possibilité de définir des fourchettes de valeurs, afin de prendre en compte les éventuelles incertitudes. Ne pouvant prendre en compte toutes les combinaisons possibles, les hommes d'étude ont proposé de construire deux tableaux par personne, le premier rassemblant les valeurs minimales et le second les valeurs maximales. En regardant globalement des résultats, il devrait être possible d'identifier les actions présentant le plus d'incertitudes et / ou de divergences entre les experts.

Poids

Onze membres du Codev ont pondéré individuellement les critères. Les jeux de poids sont tous différents, mais présentent néanmoins certaines convergences.

Agrégation

L'agrégation a été réalisée au moyen de la méthode Electre III, choisie pour son traitement précautionneux des informations utilisées [Maystre et al., 1993]. Il a été procédé à 44 analyses, résultant de la combinaison des 11 jeux de poids individuels, des deux tableaux d'évaluation (Min, Max) et des deux jeux de critères (avec et sans le critère 4). Dans tous les cas, le seuil de coupe a été fixé à 0.30 - 0.15λ.

Résultats et discussion

Les résultats d'ELECTRE III sont le classement des 58 actions du PNSE2 des « meilleures » aux « moins bonnes ». Pour qu'une action soit retenue comme action à évaluer en priorité, elle devait figurer dans la vingtaine des « meilleures » actions, si ce n'est pour la totalité, du moins pour une majorité claire des membres du Codev (Tableau 1 ; ces actions sont indiquées en gras dans le Tableau 2 en annexe).

Tableau 1. Actions mises en avant en fonction de leur présence dans les 21 premiers rangs.

Dans les 21 premiers rangs	Actions par thématique									
	I	II	III	IV	V	VI I	VIII	IX	X	XVI
Presque toujours	3			14	17, 19					
Idem, mais avec quelques divergences		7, 9		15				32, 35	37	
Dans une majorité des cas	2	5, 6, 8, 10	11, 12				25		34	39	55

Les résultats de cette première présélection d'actions ont alors été analysés par le Codev afin de vérifier que la liste offrait une bonne couverture des domaines étudiés dans l'étude et prévus par d'autres dispositions.

Cette étape a permis de sélectionner finalement un peu moins d'une trentaine d'actions (indiquées en italique dans le Tableau 2, en annexe) regroupées en treize ensembles cohérents. Elles couvrent l'ensemble du plan (aucune des 16 fiches n'a été laissée de côté) et sont aussi liées à la presque totalité des indicateurs de la Loi de Santé Publique de 2004:
- Qualité de l'air extérieur (actions 1, 2, 5 et 14).
- Qualité de l'eau (actions 5, 28, 29 et 47).
- Pesticides (action 6) qui seront ventilés selon différents milieux.

- Qualité de l'air intérieur (actions 7, 8, 9, 40 et 19).
- Risques professionnels (actions 10, 11 et 12).
- Bruit (actions 15, 37 et 39).
- Risques liés aux substances préoccupantes (actions 17 et 18).
- Allergies (action 22).
- Habitat indigne (action 25).
- Inégalités territoriales d'exposition (32, 34 et 35.

Conclusion

Les différents jeux de poids et d'évaluations des actions ont conduit à des classements divergents. Malgré cela, il a été possible de trouver une convergence minimale (c'est-à-dire majoritaire au sein du groupe d'évaluateurs) sur la première vingtaine des rangs des différents classements.

La méthode de priorisation utilisée, fondée sur l'application d'un algorithme strictement prédéfini (ELECTRE III) mais en laissant la place à la prise en compte de considérations particulières (critères additionnels) a permis de choisir de manière consensuelle, non seulement au sein du simple Codev, mais aussi au sein du Comité consultatif, une sélection largement approuvée et légitimée d'un nombre limité d'actions à soumettre à une évaluation approfondie. Ainsi, la crédibilité de l'évaluation du PNSE2 par le HCSP n'a pas souffert, voire a été renforcée, par cette étape préalable de réduction de la complexité et du volume de travail à effectuer. Ce qui n'aurait probablement pas été le cas si la méthode initialement proposée au sein du Codev – attribuer des « croix-plus » et de « tirets-moins » aux actions selon les critères et additionner ensuite les croix et les tirets pour arriver à une seule note par action – avait été utilisée.

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Annexe 1

Tableau 2. Les 58 mesures du PNSE2.

1	Réduire les émissions de particules du secteur domestique
2	Réduire les émissions de particules des installations industrielles et agricoles
3	Mieux réguler la mobilité et réduire les émissions atmosphériques unitaires et chaque mode de transport
4	Améliorer la connaissance des particules

5	Réduire les rejets de six substances toxiques dans l'eau et dans l'air
6	Améliorer les connaissances sur les expositions aux pesticides
7	Mieux connaître et limiter les sources de pollution à l'intérieur des bâtiments
8	Construire sainement par la limitation des sources dans le bâti et la maîtrise des installations d'aération, de ventilation et de climatisation
9	Mieux gérer la qualité de l'air intérieur dans les lieux publics
10	Réduire les expositions liées à l'amiante
11	Développer des actions d'incitation et d'aide à la substitution de substances toxiques en milieu de travail et favoriser le développement de procédés alternatifs
12	Renforcer le suivi des expositions professionnelles
13	Prendre en compte l'impact sur la santé des différents modes de transport
14	Favoriser les transports actifs et les mobilités douces
15	Réduire les nuisances liées au bruit généré par les transports
16	Améliorer la santé et le confort des usagers et des travailleurs des transports
17	Réduire l'exposition des enfants et des femmes enceintes ou en âge de procréer aux substances les plus dangereuses
18	Mieux gérer les risques liés aux reprotoxiques et aux perturbateurs endocriniens
19	Réduire les expositions dans les bâtiments accueillant des enfants
20	Améliorer la prise en compte de la sensibilité particulière des enfants, des femmes enceintes ou en âge de procréer dans l'expertise des risques
21	Renforcer la lutte contre les atteintes auditives et les traumatismes sonores aigus liés à l'écoute de musiques amplifiées
22	Prévenir les allergies
23	Développer la profession de conseillers « habitat-santé » ou « en environnement intérieur
24	Améliorer la prise en charge des pathologies potentiellement dues à l'environnement
25	Conforter et développer le programme national de traitement de l'habitat indigne
26	Prévenir l'insalubrité due à la suroccupation
27	Créer des mesures ciblées d'accompagnement social
28	Protéger de manière efficace la ressource aux échelles des périmètres de protection et des aires d'alimentation des captages (Décline l'engagement 101 du Grenelle)
29	Réduire les apports de certaines substances dans le milieu aquatique
30	Maîtriser la qualité sanitaire de l'eau distribuée
31	Assurer une gestion durable de la disponibilité en eau
32	Identifier et gérer les zones géographiques pour lesquelles on observe une surexposition à des substances toxiques
33	Améliorer la prévention et assurer la gestion des impacts sanitaires et environnementaux post accident
34	Renforcer la gestion des sites et sols pollués
35	Réhabiliter ou gérer les zones contaminées, notamment outre-mer
36	Evaluer l'impact sanitaire des différents modes de gestion des déchets
37	Intégrer la lutte contre le bruit dans une approche globale
38	Renforcer la police du bruit
39	Se doter d'outils permettant d'appréhender l'impact sanitaire du bruit
40	Réduire l'exposition au radon dans l'habitat
41	Gérer les expositions à l'amiante environnemental

42	Améliorer le dispositif d'alerte et de surveillance
43	Lancer un programme pluriannuel de biosurveillance de la population française couplé à une enquête de santé plus large et incluant le dosage des polluants émergents
44	Renforcer la concertation sur les risques liés aux nouvelles technologies
45	Organiser l'information et la concertation sur les ondes électromagnétiques
46	Renforcer la réglementation, la veille et l'expertise et la prévention des risques sur les nanomatériaux
47	Gérer les risques liés aux Déchets d'Activités de Soins à Risques Infectieux (DASRI)
48	Afficher clairement le domaine santé environnement travail dans les politiques scientifiques des différents opérateurs de recherche et renforcer les moyens humains et financiers
49	Structurer et coordonner la recherche en santé environnement travail et renforcer les outils nécessaires
50	Renforcer les disciplines de recherche majeures et les thématiques prioritaires pour la prédiction et l'évaluation des risques et dangers environnementaux, notamment sur les pathologies en forte augmentation ou (re)émergentes et sur les risques émergents
51	Renforcer la recherche sur les contaminants de la chaîne alimentaire
52	Favoriser la recherche technologique et l'innovation pour l'accompagnement des entreprises vers des pratiques plus respectueuses de la santé et de l'environnement
53	Rationaliser les conditions et pratiques d'expertise scientifique en appui aux décisions de politiques publiques
54	Renforcer les capacités d'expertise scientifique en santé environnement travail
55	Développer la formation en santé environnement travail des professionnels de santé
56	Développer la formation en santé environnement travail dans l'enseignement supérieur et technique
57	Eduquer les jeunes en santé environnement travail
58	Développer des outils d'information en santé environnement travail et en mesurer l'impact

Persons and Facts

ROYAL ACADEMY OF DOCTORS

(Spain) 1914-2014

Professor Constantin Zopounidis (Technical University of Crete and Audencia Nantes School of Management) was elected Academician on Thursday, July 10, 2014 in a formal meeting for the 100th anniversary of the formal establishment of the Royal Academy of Doctors. The foundation efforts started in the Middle Ages when the Spanish Government appointed a Council of 100 Elders which would deal with the establishment of laws in maritime law and commerce in Barcelona. After several attempts in 1914, the Council of Elders was renamed Royal Academy of Doctors, and is based in Barcelona.

Software

ROR-UTADIS: diviz software components for value-based multiple criteria sorting

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In this short paper, we present a framework for preference modelling and robustness analysis in value-based multiple criteria sorting, called ROR-UTADIS [1], along with its software implementation on the diviz platform. ROR-UTADIS can be seen as a generalization of UTADIS [2], significant extension of the UTADIS [GMS] method [3], and an inherent part of the Robust Ordinal Regression paradigm [4].

ROR-UTADIS methodological framework

Preference information

The indirect preference information supplied by the Decision Maker (DM) is composed of:

(1) possibly imprecise assignment examples (e.g., "*a* should be assigned to class *bad*" or "*b* should not be placed in class *good*");

(2) desired class cardinalities (e.g., "at most 10 alternatives can be assigned to class good" or "at least half of the alternatives should be judged as *bad*";

(3) assignment-based pairwise comparisons (e.g., "*a* should be assigned to a class at least as good as *b*" or

"there is a difference of at least/at most two classes between *c* and *d*").

Accounting for all these preference statements, we provide the most flexible modelling framework that incorporates a wide spectrum of indirect and imprecise preference information coming from the DM.

Preference model

In order to represent the DM's preference information, we use a preference model in form of an additive value function. We also account for the DM's preferences concerning the shape of the marginal value functions. Thus, for each criterion (s)he can provide the number of characteristic points (or segments). In this way, one can express the will of considering a linear, piece-wise linear, or even general (not involving any arbitrary parametrization) marginal value function.

Sorting procedure

To conduct sorting, we use a threshold-based value driven sorting procedure. In this approach, each class is delimited by the lower and upper thresholds defined on the comprehensive value. To work an assignment for each alternative, one needs to compute its comprehensive value, and to verify to which range it would fall. For instance, if the lower threshold for class medium would be 0.4 and the upper one 0.7, all alternatives with a score not less than 0.4 and less than 0.7 would be judged as medium. The underlying idea is illustrated in Figure 1.
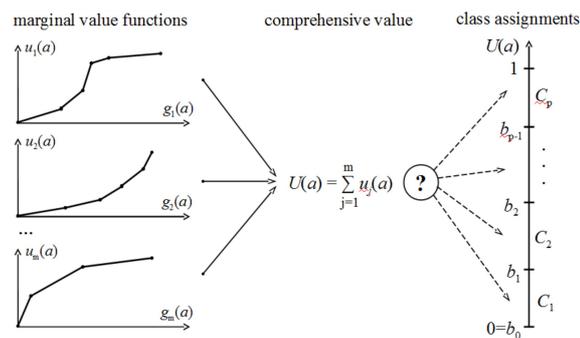

Fig.1. Threshold-based value-driven sorting procedure

Direct specification of the exact course of marginal value functions and class thresholds separating the classes is too demanding in terms of DM's cognitive effort. Thus, we infer a set of value functions and class thresholds that are compatible with the diverse preference information (s)he provides.

Sorting recommendation

The exploitation of all value functions and class thresholds compatible with these preferences results in three types of results:

(1) necessary and possible assignments, which are defined as class ranges to which an alternative is assigned by, respectively, all and at least one compatible value function and class thresholds;

(2) extreme class cardinalities indicating the minimal and maximal number of alternatives that are simultaneously assigned to some class;

(3) necessary assignment-based preference relations, which holds if one alternative is always assigned to a class at least as good as the other.

These outputs correspond to different types of admitted preference information, i.e., assignment examples, assignment-based pairwise comparisons, and desired class cardinalities. In this way, the preference information of each type is reproduced in the respective outcome. The DM may thus observe the impact of her/his preferences on the sorting recommendation concerning the whole set of alternatives (in case of assignments), all pairs of alternatives (in case of assignment-based preference relations), and all classes (in case of extreme class cardinalities).

ROR-UTADIS software components on diviz

Diviz is an open-source which allows to design, execute, and share complex workflows implementing procedures of decision analysis. The software infrastructure consists of a Java client for algorithmic workflow design and visual analysis of the outcomes, and distant servers for executing the workflows.

MCDA procedures as well as visualization or reporting tools are available in diviz via XMCDA web-services. They need to read inputs and write outputs formatted using the XMCDA standard. XMCDA represents MCDA concepts (e.g., alternative, class, outranking relation, or veto threshold) using general data structures referred to as MCDA types which are coded in XML with tags and attributes. In this way, the standard ties together all the web-services, making their interoperability possible.

Procedures for construction of a set of compatible value functions and class thresholds as well as computation of the sorting recommendation have been implemented as a collection of individual modules (components). Each of them is responsible for deriving different type of results.

In Figure 2, we present a structure of the module computing the possible and necessary assignments.
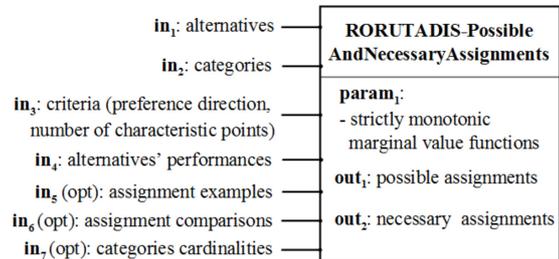

Fig. 2. Structure of the diviz module for computing possible and necessary assignments

RORUTADIS-PossibleAndNecessaryAssignments requires the user to specify a set of alternatives (in1), their performances (in4), decision classes (categories, in2), a set of criteria along with their preference direction and number of characteristic points for each marginal value function (in3). The user may parametrize the module (param1) to indicate that these functions should be strictly monotonic. Another three inputs concern the DM's preference information: assignment examples (in5), assignment-based pairwise comparisons (in6), and desired class cardinalities (in7). These inputs are optional so that the user can choose which types of preference information (s)he wishes to provide. The two outputs of the module provide the possible (out1) and necessary (out2) assignments.

The two remaining modules requiring exactly the same input are:

RORUTADIS-NecessaryAssignment-basedPrefereceRelation provides pairs of alternatives for which the necessary assignment-based relations is satisfied. Its output can be visualized as the Hasse diagram with the plotAlternativesHassDiagram module.

RORUTADIS-ExtremeClassCardinalities provides for each class its minimal and maximal cardinality.

The detailed documentation of these modules will be available at the diviz website [1].

The design of decision analysis workflows in diviz is performed via an intuitive graphical user interface. Each component is represented by a rectangular box which can be linked to data files or other computation modules. To construct a workflow, the user chooses the modules (s)he is interested in from the list of available elements. Using a ``drag-and-drop" function, (s)he adds them to the workspace along with the data files. Subsequently, the inputs and outputs of different components can be linked using connectors to

define the structure of the workflow. Once the design is finished, it is possible to execute the workflow.

Illustrative example

To illustrate the proposed approach, we will refer to the problem of assessing environmental impact of cities. It has been originally considered by the Economist Intelligence Unit. A set of fifteen European cities is rated across a range of specific areas, such as the intensity of CO_2 emission, energy consumption, water management, and waste use. All these criteria have the form of indicators aggregating several more detailed aspects which contribute to a score on a 0 to 10 scale. The performance table, as visible in diviz, is provided in Figure 3.

	co2	energy	water	waste
OSL	9.58	8.71	6.85	8.23
STH	8.99	7.61	7.14	7.99
CPH	8.35	8.69	8.88	8.05
BRU	8.32	6.19	9.05	7.26
PAR	7.81	4.66	8.55	6.72
ROM	7.57	6.4	6.88	5.96
MAD	7.51	5.52	8.59	5.85
IST	4.86	5.55	5.59	4.86
ATH	4.85	4.94	7.26	5.33
WAR	4.65	5.29	4.9	5.17
LIS	4.05	5.77	5.42	5.34
PRG	3.44	3.26	8.39	6.3
BEG	3.15	4.65	3.9	4.3
SOF	2.95	2.16	1.83	3.32
KIE	2.49	1.5	5.96	1.43

Fig. 3. Performance table

The aim is to assign these cities to three decision classes: C1-C3 (with C3 being the best one).
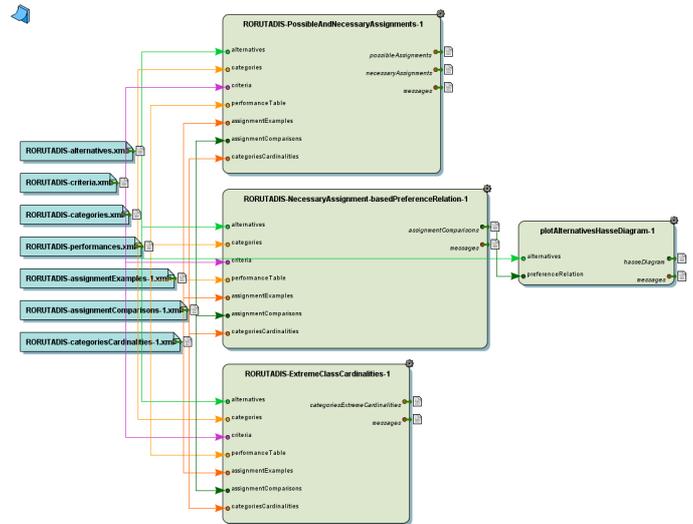
Preference information

Let us consider the following pieces of indirect preference information coming from the DM:

• assignment examples: CPH → C3, SOF → C1, ROM → C2, PAR → ≥ C2, and LIS → ≤ C2.

• assignment-based pairwise comparisons: IST is by at least one class better than WA, STH (CPH) should be assigned to a class at least as good as CPH (STH), and ATH is by at most one class better than PRG.

• desired class cardinalities: card(C1)≥5, 3≤card(C2)≤7, and card(C3)≤4.

Sorting recommendation

Let us start the analysis of results with the necessary assignments (see Figure 5, left column). For some cities (e.g., STH, WAR) they are already non-empty which means that there is no doubt with respect to their assignments.

- OSL ->
- STH -> [C3 ; C3]
- CPH -> [C3 ; C3]
- BRU ->
- PAR ->
- ROM -> [C2 ; C2]
- MAD -> [C2 ; C2]
- IST -> [C2 ; C2]
- ATH ->
- WAR -> [C1 ; C1]
- LIS ->
- PRG ->
- BEG -> [C1 ; C1]
- SOF -> [C1 ; C1]
- KIE -> [C1 ; C1]

- OSL -> [C2 ; C3]
- STH -> [C3 ; C3]
- CPH -> [C3 ; C3]
- BRU -> [C2 ; C3]
- PAR -> [C2 ; C3]
- ROM -> [C2 ; C2]
- MAD -> [C2 ; C2]
- IST -> [C2 ; C2]
- ATH -> [C1 ; C2]
- WAR -> [C1 ; C1]
- LIS -> [C1 ; C2]
- PRG -> [C1 ; C2]
- BEG -> [C1 ; C1]
- SOF -> [C1 ; C1]
- KIE -> [C1 ; C1]

Fig 5. The necessary (left column) and possible (right column) assignments.

If the necessary assignment was empty, it indicates that sorting recommendation suggested by different compatible preference model instances differs. Indeed, this is confirmed by the possible assignments. For example, BRU is assigned either to class C2 or C3, whereas the hesitation w.r.t. the assignment of PRG concerns C1 and C2.

The most prevailing way of presenting the necessary assignment-based preference relation is to show the Hasse diagram of this relation (see Figure 6).
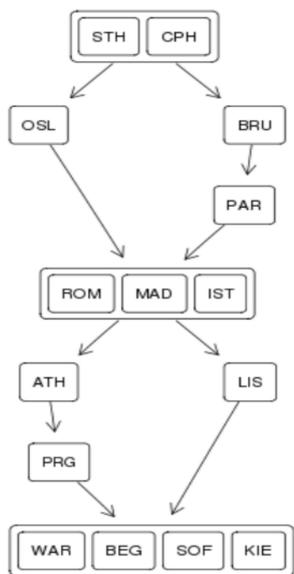

Fig. 6. Hasse diagram of the necessary assignment-based preference relation

It should be interpreted in the following way. If some alternatives are grouped together in a single node (e.g., STH and CPH), they are always assigned to the same class. If two nodes are connected by an arrow either directly as STH and OSL or indirectly as STH and ROM, it means that one alternative is always assigned to a class at least as good as the other, while the opposite is not true. Pairs of alternative which are not connected by an arrow, like ATH and LIS are incomparable in terms of the necessary assignment-based preference relation. It means that for some compatible preference model instances one of them is assigned to a class better than the other, while for some other instances the order of classes is inverse.

Finally, the extreme class cardinalities reflect what is the minimal and maximal number of cities that can be assigned to each class. For instance, the number of alternatives that can be judged as bad is between five and seven (see Figure 7).

C1	[5 ; 7]
C2	[4 ; 7]
C3	[3 ; 4]

Fig. 7. Extreme class cardinalities

The ROR-UTADIS framework method is intended to be used interactively, that is, the DM can provide progressively:
- new assignment examples (if (s)he judges that the possible assignments are not precise enough),
- new assignment-based pairwise comparisons (for pairs of alternatives which are incomparable in terms of the necessary assignment-based preference relation), and
- more precise desired class cardinalities (if the ranges obtained at the current stage of interaction are too wide).

The process should be continued until the recommendation is decisive enough for the DM to attribute final grades to cities.

The verion of diviz with ROR-UTADIS modules can be downloaded from:
http://www.cs.put.poznan.pl/mkadzinski/diviz/

whereas the official release on the diviz website is scheduled for the first months of 2015.

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FORUM

ELECTRE – Past, Present and Future

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Abstract

Multi-criteria decision analysis (MCDA) is a valuable resource within operations research and management science. Various MCDA methods have been developed over the years and applied to decision problems in many different areas. The outranking approach, and in particular the family of ELECTRE methods, continues to be a popular research field within MCDA, despite its more than 40 years of existence. A comprehensive overview of papers utilizing ELECTRE and ELECTRE-based methods in various areas are analyzed.

1   Introduction

Decision-making is an important part of most human activities, regardless if we are performing daily activities, professional or political work. Some decisions may be relatively simple, especially if the consequences of a bad decision are small, while others can be very complex and have significant effects. Real-life decision problems will in general involve several conflicting points of view (criteria) that should be taken into account conjointly, in order to arrive at a reasonable decision.

Research devoted to such problems is most often referred to as multi-criteria decision making or multiple criteria decision making (MCDM). Some authors prefer the name multi(ple)-criteria decision aiding, e.g. Roy (1990), while others use the name multi(ple)-criteria decision analysis (MCDA). We will use MCDA, as it is considered a compromise between the other two names (Hanne, 1995). Many different methods have been proposed to assist in MCDA problems (Zavadskas and Turskis, 2011). Common for these methods, is that they attempt to manage "at best" the conflicting character of the various criteria, in order to assist a decision maker in making a qualified decision.

Various classifications of MCDA methods have been proposed in the literature (Mendoza and Martins, 2006). One of the early categorizations classifies MCDA methods into two groups according to the size of the set of alternatives under consideration. Multi-attribute decision making (MADM) methods are designed for problems with a pre-defined discrete set of alternatives, whereas multi-objective decision making (MODM) methods are for problems where the alternatives are not pre-defined (Hwang and Yoon, 1981). It should be noted that the terms MADM and MCDA (or MCDM) sometimes are used interchangeably in the literature (Triantaphyllou, 2000), which may lead to some confusion. Another classification proposed by Belton and Stewart (2002) considers three types of MCDA methods: 1) value measurement models, where each alternative is assigned a numerical score that can be used to indicate the degree to which a given alternative is preferred to another; 2) goal, aspiration or reference level models that attempts to select alternatives, which are closest to achieve some pre-defined goals or aspirations; 3) outranking models, which are based on pairwise comparisons of alternatives against each other (or against a pre-defined norm) on each criterion, followed by a procedure that aggregates and exploits the information, in order to determine the strength of evidence supporting that one alternative should be favored over another (Mendoza and Martins, 2006). This work provides a an overview of applications or developments of ELECTRE and ELECTRE-based methods

2. A brief history and overview of ELECTRE methods

The first ELECTRE method was presented by Benayoun et al. (1966) who reported on the works of the European consultancy company SEMA with respect to a specific real world problem. But the first journal article did not appear until 1968, when Roy (1968) described the method in detail. Later, it was renamed to ELECTRE I. The name ELECTRE Iv (v for veto) is sometimes used when veto thresholds are taken into account, but is not considered an official name

(Figueira et al., 2005). Several other ELECTRE methods were developed during the following two decades: ELECTRE II (Roy and Bertier, 1971), ELECTRE III (Roy, 1978), ELECTRE IV (Roy and Hugonnard, 1982), ELECTRE TRI ((Yu, 1992), (Roy and Bouyssou, 1993)) and ELECTRE IS (Roy and Bouyssou, 1993). ELECTRE TRI was later renamed to ELECTRE TRI-B (Figueira et al., 2010), when a new version, ELECTRE TRI-C (Dias et al., 2010) was developed, but most of the literature still use the name ELECTRE TRI for the original version. To avoid conflicts with the naming in the articles, we will use the name ELECTRE TRI instead of ELECTRE TRI-B for the remainder of this paper. Recently, ELECTRE TRI-nC, was presented by Dias et al. (2012) as an extension of ELECTRE TRI-C. All methods, except ELECTRE I, Iv & II, take into account the concept of pseudo-criteria (Roy and Vincke, 1984). Thanks to indifference and preference thresholds, this concept allows to model imperfect knowledge, which may be a result of uncertainty, imprecision, and ill-determination of certain data. A more detailed history and overview of the ELECTRE methods can be found in Figueira et al. (2005).

3. Main classification and categorization of papers

Totally 669 papers are considered and out of 669 papers, 529 papers belong to applied papers category (figure 1), 57 papers belong to Survey, review and overview (SRO) papers (review papers generally include descriptions of some ELECTRE or ELECTRE-based applications from the literature, whereas survey papers may describe or discuss the possible application of such methods. Some of the overview papers are specifically dedicated to concepts from ELECTRE or outranking methods in general, and some also include other methods, such as MAUT-based methods), 20 papers on MCDA method and model selection (MMS) and 63 papers belongs to Preference disaggregation and theoretical and non-application (PTN) papers.
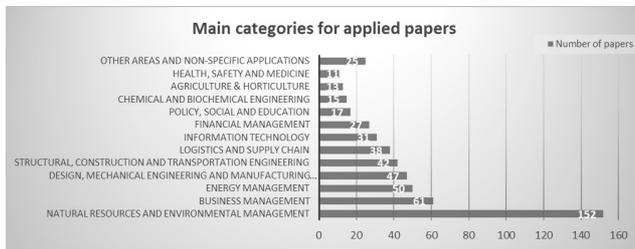

Figure 1: Distribution of applied papers according to main categories

4. Distribution by journals and year of publication

A total of 325 journals have published papers related to the ELECTRE methods. Table 1 shows the journals in descending order, with respect to the number of published articles. The journal, with most publications is European Journal of Operational Research. They have published more than three times as many articles than the second in the list, which is Journal of Multi-Criteria Decision Analysis and more than five times more than each of the next two: Computers & Operations Research and Expert Systems with Applications. Most journals have only published one or two articles.

Table 1: Distribution by journals for all papers

Journal	#	%
European Journal of Operational Research	80	12.0
Journal of Multi-Criteria Decision Analysis	25	3.7
Computers & Operations Research	15	2.2
Expert Systems with Applications	15	2.2
Omega	11	1.6
Decision Support Systems	10	1.5
Water Resources Bulletin	8	1.2
Journal of the Operational Research Society	7	1.0
Annals of Operations Research	6	0.9
International Transactions in Operational Research	6	0.9
Materials & Design	6	0.9
Operational Research - An International Journal	6	0.9
Pesquisa Operacional	6	0.9
Water Resources Research	6	0.9
Foundations of Computing and Decision Sciences	5	0.7
Fuzzy Sets and Systems	5	0.7
Informatica	5	0.7
International Journal of Production Research	5	0.7
Renewable and Sustainable Energy Reviews	5	0.7
Technological and Economic Development of Economy	5	0.7
Theory and Decision	5	0.7
Waste Management	5	0.7
Water Science and Technology	5	0.7
Building and Environment	4	0.6
Energy Policy	4	0.6
Environmental Management	4	0.6
International Journal of Multicriteria Decision Making	4	0.6
Journal of Applied Sciences	4	0.6
Journal of Cleaner Production	4	0.6
Journal of Environmental Management	4	0.6
Journal of Water Resources Planning and Management	4	0.6
Systems, Man and Cybernetics, IEEE Transactions on	4	0.6
Waste Management & Research	4	0.6
4OR	3	0.4
Agricultural Water Management	3	0.4
Agronomy for Sustainable Development	3	0.4
Applied Mathematical Modelling	3	0.4
Applied Mathematics and Computation	3	0.4
Computers & Industrial Engineering	3	0.4
Energy	3	0.4
Environmental Impact Assessment Review	3	0.4
Information Sciences	3	0.4
International Journal of Geographical Information Science	3	0.4
International Journal of Information Technology &	3	0.4

Decision Making		
Journal of Advanced Transportation	3	0.4
Journal of Civil Engineering and Management	3	0.4
Journal of Decision Systems	3	0.4
Journal of Global Optimization	3	0.4
Journal of Hydroinformatics	3	0.4
Papers of the Regional Science Association	3	0.4
Regional and Urban Economics	3	0.4
Water Resources Management	3	0.4
Yugoslav Journal of Operations Research	3	0.4
2 articles from each of 45 journals	90	13.5
1 article from each of 227 journals	227	33.9
Total	669	100

The frequency distribution and percentage of published articles with respect to year of publication is shown in Table 2 for all papers as well as for each of the group categorizations. The starting year in the table is 1968, which was chosen for this paper. In general three year intervals are used, but since only a few articles were found for the earliest years, we let the first interval cover six years.

Table 2: Distribution by year for all papers

Years	All	%	Appl.	%	SRO	%	MMS	%
1968-1973	5	0.7	2	0.4	3	5.3	0	0.0
1974-1976	6	0.9	5	0.9	1	1.8	0	0.0
1977-1979	5	0.7	4	0.8	0	0.0	1	5.0
1980-1982	11	1.6	7	1.3	3	5.3	0	0.0
1983-1985	12	1.8	8	1.5	1	1.8	1	5.0
1986-1988	23	3.4	15	2.8	2	3.5	2	10.0
1989-1991	18	2.7	14	2.6	2	3.5	1	5.0
1992-1994	26	3.9	18	3.4	3	5.3	2	10.0
1995-1997	38	5.7	27	5.1	2	3.5	2	10.0
1998-2000	45	6.7	31	5.9	2	3.5	2	10.0
2001-2003	69	10.3	53	10.0	4	7.0	2	10.0
2004-2006	68	10.2	50	9.5	11	19.3	1	5.0
2007-2009	135	20.2	109	20.6	9	15.8	3	15.0
2010-2012	173	25.9	159	30.1	8	14.0	2	10.0
2013-	35	5.2	27	5.1	6	10.5	1	5.0
Total	669	100	529	100	57	100	20	100

5.   Future Research

Future research can be targeted against application of some of the new ELECTRE methods or application of ELECTRE methods, which are overlooked, either in a specific area or in general. Examples include ELECTRE III and TRI, which have been applied less than some of the simpler ELECTRE methods in some areas, especially in design, mechanical engineering and manufacturing systems and logistics and supply chain.

Since it does not require criteria weights, ELECTRE IV may be a good choice as a decision module in, for example, computer algorithms or other problems, where user interaction may not be desirable. In light of the recent increasing popularity of ELECTRE I, ELECTRE IS could maybe be a better choice of method, provided that simplicity is not a concern. ELECTRE TRI and the related software, which can assist in determining the parameters, could be a good choice for risk assessments, for example in health and safety management or logistics and supply chain management. The same can be said for ELECTRE TRI-C & TRI-nC, which generally have not been used much yet.

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About the 80th Meeting

Faculté des sciences de l'administration de l'Université Laval (FSA ULaval), Université Laval (FSA ULaval), 8-11 October 2014

The 80th meeting of the European Working Group on Multiple Criteria Decision Aiding took place at Laval University, Québec, Canada from October 9th to 11th, 2014. The meeting was hosted by the Faculté des Sciences de l'Administration (FSA-ULaval) and organized by Pr. Irène Abi-Zeid, with the help of the Service des communications et de recrutement of FSA-ULaval. The program committee was composed of I. Abi-Zeid, S. Ben-Amor, and J.-P. Waaub, while the organizing committee was composed of I. Abi-Zeid, M. Gagné, A. Pellerin, and M. Morin. The meeting was a great success with 81 participants from 11 countries, including 31 students and 15 participants from the non-academic world.

The topic of the meeting was "Transparency in Public Decisions". The objective was to discuss multicriteria methods and approaches to improve public decision making in order to avoid unfortunate situations such as collusion and corruption. The meeting was supported by EWG-MCDA, the Canadian Operational Research Society (CORS), the Telfer School of Business at Ottawa University, the research groups CERMID, CIRRELT, and GERAD, as well as the Department of opérations et systèmes de decision and FSA-ULaval.

The meeting took place in the building of FSA-ULaval, Pavillon Palasis-Prince. Contributed sessions started on Thursday afternoon, after the opening ceremony by Pr. Michel Gendron, Dean of FSA-ULaval, followed by an address by Pr. Abi-Zeid, general chair of the meeting. The submitted papers were organized in 6 sessions over two days. There were 19 oral presentations and 6 papers submitted for discussion. The abstracts were printed and are available on the web page of the meeting (see below). The banquet was held Thursday evening at the George-V at Hôtel Château Laurier in old Québec.

The social program on Saturday included a guided tour of the Wendake Amerindian Reserve (Hurons-Wendats nations) and of the Hotel-Museum Premières Nations, followed by a visit to the Park of Chute-Montmorency. The group then headed to Île d'Orléans to enjoy lunch at l'Auberge la Grange de l'île. The day ended with a guided tour of Vieux-Québec including the Old Port, la Grande Allée, and the Plains of Abraham.

More information about the meeting can be found at:

www.fsa.ulaval.ca/MCDA2014

Pictures of the event can be found at:

https://www.flickr.com/photos/fsaulaval/sets/7215764879 0354255/

Irène Abi-Zeid (irene.abi-zeid@osd.ulaval.ca)

80e Journées du Groupe de Travail Européen «Aide Multicritère à la Décision»
80th Meeting of the European Working Group «Multiple
Criteria Decision Aiding»
(Faculté des sciences de l'administration de l'Université Laval (FSA ULaval), Université Laval (FSA ULaval), 8-11 October 2014)

SCIENTIFIC PROGRAM /PROGRAMME SCIENTIFIQUE

Programme
Program
Jour 1 / Day 1
Jeudi 9 octobre 2014
Thursday October 9th, 2014
Salon Hermès (local 1651)
Pavillon Palasis-Prince
Université Laval
11:30   Inscription / Registration
Léger lunch / Light Lunch
12:30   Mot de bienvenue / Welcome
M. Michel Gendron, Doyen / Dean FSA ULaval
Mme Irène Abi-Zeid, Professeure titulaire / Professor FSA ULaval
13:00 – 15:00   Session 1 – Les décisions publiques / Public Decisions
Responsable de session / Session chair: Irène Abi-Zeid
13:00   Jean-Claude Vansnick
Quelques propositions (issues de la pratique du multicritère) susceptibles de favoriser la transparence et le bon déroulement des processus d'évaluation (de la qualité) dans le secteur public
13:30   Jacques Lafrance
Serait-il possible de demander de spécifier un repère composé de deux éléments (bon et neutre) pour chaque critère de qualité dans le cadre de marchés publics de services professionnels ?
14:00   Serge Bourgouin
Évaluation de la qualité des images dans le cadre d'un marché public concernant l'acquisition d'équipements en résonnance magnétique
14:30   Roxane Lavoie
Déroulement d'un processus d'évaluation mené selon les recommandations proposées : un exemple d'étude réalisée pour le Service de l'environnement de la ville de Québec
15:00   Pause café / Coffee Break

15:30 – 17:30   Session 2 – Les décisions publiques – suite / Public Decisions - continued
Responsable de session / Session chair: Sarah Ben Amor
15:30   Maria Franca Norese
The Need for Structuring in MCDA Interventions
16:00   Jean-François Guay, Jean-Philippe Waaub
Hiérarchiser et expliciter les choix politiques locaux en contexte de proximité sociale
16:30   Pierre Rondier
Le suivi par indicateur des outils de planification territoriale au Québec : Pourquoi et comment ?
17:00   Yuji Sato
Public Service Analysis and Public Sector Reform
Papier soumis à discussion / Discussion Paper
1.   Ewa Roszkowska, Tomasz Wachowicz - Application of TOPSIS to Scoring the Negotiation Offers from Outside the Feasible Negotiation Space
17:30   Fin de la journée 1 / End of day 1
19:30 – 23:00   Banquet à l'Hôtel Château Laurier
Salle George-V
1220, Place George-V Ouest
Québec (Québec)

Jour 2 / Day 2
Vendredi 10 octobre 2014
Friday October 10th, 2014
Local 1317
Pavillon Palasis-Prince
Université Laval
8:30 – 10:30   Session 3 – Environnement et ressources naturelles / Environment and Natural Resources
Responsable de session / Session chair: Jean-Philippe Waaub
8:30   Franck Taillandier, Régis Pommier, Christophe Fernandez, Amadou Ndiaye, René Oum
Optimisation de l'utilisation du pin maritime
9:00   Francis Macary
Using Multiple Criteria Decision Aid for the National Project in Agroecology, Managed by the French Ministry of Agriculture
9:30   Eleftherios Siskos, Dimitris Peronikolis, John Psarras
Rationalizing Electricity Production Investments from Renewable Energy Sources in Greece Using a Synergy of Multicriteria Methods
10:00   Sonja Behmel
Decision Support Tool for Designing and Optimizing Monitoring Strategies for Surface Water Quality Based on a Participative Approach
Papiers soumis à discussion / Discussion papers
1.   Roman Slowinski, Milosz Kadzinski - Multiobjective Optimization with Cone Contraction
2.   Anissa Frini, Sara Ben Amor - A Multi-Criteria Multi-Period Aggregation Procedure for Sustainable Project Selection
10:30   Pause café / Coffee Break

11:00 – 12:30   Session 4 – Décisions multicritères dans les organisations / Multicriteria Decisions in Organizations
Responsable de session / Session chair: Maria Franca Norese
11:00   Lalla Samira Touhami, Daoud Ait-Kadi, Med Anouar Jamali
Le choix des prestataires de maintenance par l'approche de modélisation multicritère
11:30   Evelyne Lombardo, Serge Agostinelli, Sophie Arvanitakis, Marie Ouvrard, Marielle Metge
Bizprojet: un moteur d'affinités comme aide à la décision pour les donneurs d'ordre
Papiers soumis à discussion / Discussion papers
1.   Axile Talout, Irène Abi-Zeid - Approche multicritère pour l'évaluation de projets d'aide au développement
2.   Kannan Govindan, Martin Brandt Jepsen - An Integrated Approach for Sustainable Supplier Selection: A Case Study from Textile Industry
12:30   Lunch
14:00 – 15:30   Session 5 – Développements méthodologiques et logiciels / Methodological and Software Developments
Responsable de session / Session chair: Michael Morin
14:00   Yves De Smet, Renaud Sarrazin, Dimitri Van Assche
Extending PROMETHEE to Partial and Complete Clustering
14:30   Dorota Górecka, Ewa Roszkowska, Tomasz Wachowicz
MARS – A Hybrid of ZAPROS and MACBETH for Verbal Evaluation of the Negotiation Template
15:00   Nicolas Couture-Grenier, Irène Abi-Zeid, Oscar Nilo, Luc Lamontagne
MCDA-ULaval : un outil d'aide à la décision multicritère
Papier soumis à discussion / Discussion paper
1.   Fouad Ben Abdelaziz, Ray Saadaoui, Ahmed Bouri - Multi-Criteria Optimal Stopping Methods Applied to Portfolio Optimization Problem
15:30   Pause café / Coffee Break
16:00 – 18:00   Session 6 – Élicitation des préférences / Preference Elicitation
Responsable de session / Session chair: Franck Taillandier
16:00   Miłosz Kadziński, Salvatore Greco, Roman Słowiński
Robust Ordinal Regression for Dominance-based Rough Set Approach to Multiple Criteria Sorting
16:30   Kazimierz Zaras, Jean-Charles Marin, Bryan Trudel
Interactive Cycle with Elicitation of Preferences on Two Central and Local Decision Making Levels Presented on the Example of the Classification of Municipalities in the Territory of Northern Quebec

17:30   Vie du Groupe et présentation des prochaines journées multicritères / The life of the Group and Presentation of the next EWG-MCDA meetings
Vincent Clivillé : Avril 2015, France
Kannan Govindan : Octobre 2015, Danemark
Mot de la fin / Concluding Remarks

Jour 3 / Day 3
Samedi 11 octobre 2014
Saturday October 11th, 2014
10:00 – 17:15   Journée d'activités sociales / Social Activities Day (Excursion)
10:00   Départ du pavillon Palasis-Prince
         Departure from Palasis-Prince Building
10:15   Visite de la réserve des Hurons-Wendats (Wendake)
         Visit of the Wendake Amerindian Reserve (Hurons-Wendats)
12:00   Visite du Parc de la Chute-Montmorency
         Visit of Parc de la Chute-Montmorency
12:45   Tour de l'île d'Orléans
         Ile d'Orléans Tour
13:15   Lunch à l'Auberge la Grange de l'île
         Lunch at Auberge la Grange de l'île
15:00   Visite du Vieux-Québec
         Visit of Vieux-Québec
17:00   Départ pour le pavillon Palasis-Prince
         Departure for the Palasis-Prince Building
17:15   Retour au pavillon Palasis-Prince
         Return to the Palasis-Prince Building

European Multiple Criteria Decision Aiding (MCDA) Spring School - Multiple criteria decision making: a key for sustainability. (May 26th -31st, 2014)

The first edition of the European Multiple Criteria Decision Aiding Spring School took place in Perugia, at the Department of Agricultural, Food and Environmental Sciences. The topic was "Multiple criteria decision making: a key for sustainability".

The aim of the school was to provide to doctoral students/young researchers a comprehensive presentation of the Multiple Criteria Decision Aiding (MCDA) methodologies and their potentials for real world applications. Therefore, the school paid attention to both the theoretical basis of MCDA, and the applications of MCDA, with a special focus on sustainability issues. Geographical Information Systems concepts, tools and applications in a spatial context received a special attention due to their importance in land planning and management.

To address the development of a network of young researchers in MCDA, a poster student sessions took place to give the opportunity to the participants to present and promote their works in the field of MCDA.

The lecturers who helped in delivering the scientific programme are: Antonio Boggia, Salvatore Corrente, José Figueira, Salvatore Greco, Alessio Ishizaka, Milosz Kandiski, Benedetto Matarazzo, Giuseppe Munda, Lucia Rocchi and Roman Slowinski.

The lectures were complemented with the lab sessions, given by Gianluca Massei, Cecilia Ricci, Roberta Caliò, and Luisa Paolotti.

The School has been attended by 53 participants from 15 countries. This clearly shows that MCDA attracts young scholars.

Based on the satisfactory final questionnaire results it can be affirmed that the school was a success. The school was organized by the research group "Environmental Laboratory" of the Department, under the supervision of the EURO Working Group on Multiple Criteria Decision Aiding and benefit from the contribution of ARPA Umbria (Regional Agency for Environmental Protection) and the partnership of CeSET (Italian association of appraisers and land economists) and .

Moreover the School was an eco-sustainable event. Therefore, the organization took into account all the environmental aspects related to the school, which will be also connected to the behavior of participants. For instance, the didactic materials, and also posters, was shared only in digital format, printing it only if strictly necessary; all the additional material (as badges) was made in natural or recycled material; waste was collected separately; the coffee breaks provided were made with organic and local food, as for the social events. The eco-

management of the school was provided by CARE srl, spin-off of the University of Perugia.

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
16 décembre 2014: Conférence de Thierry Marchant (Université de Gand) - Agrégation de proportions

20 janvier 2015: Conférence de Jean Simos (Université de Genève) - Traiter les problems vicieux (wicked problems) en promotion de la santé: de nouvelles approches pour l'aide multicritère à la décision?

10 février 2015: Conférence de José Figueira et Bernard Roy (Technical University of Lisbon et LAMSADE Université Paris-Dauphine) - Validation d'ELECTRE III avec interactions sur un cas précis

10 mars 2015: Conférence de Marc Pirlot (Ecole Polytechnique de Bruxelles) - Histoires de poids

Forthcoming meetings

81st Meeting of EWGMCDA
March 26-28, 2015
Annecy, France
Organizer: Vincent Cliville (Universite de Savoie)
Website:http://www.polytech.univ-savoie.fr/index.php?id=2953&L=0

82nd Meeting of EWGMCDA
September, 2015
Odense (Denmark)
Organizer: Kannan Govindan (University of Southern
Denmark)

29/3 – 01/04/2015
EMO 2015
The 8th International Conference on Evolutionary Multi-
Criterion Optimization
Guimarães, Portugal
http://www.dep.uminho.pt/EMO2015/

30/3 – 01/04/2015
EURO Mini Conference on Improving Healthcare: new
challenges, new approaches
Coimbra, Portugal
www.minieuro2015.com

3-7/8/2015
23rd International Conference on Multiple Criteria
Decision Making MCDM 2015
Hamburg, Germany
http://www2.hsu-hh.de/logistik/MCDM-2015/

Announcements and Call for Papers

Below you can find the link for the new issue of our
IJMCDM.

http://www.inderscience.com/info/inarticletoc.php?
jcode=ijmcdm&year=2014&vol=4&issue=2

**Master «Modeling, Optimization, Decision,
Organization (MODO) »**
Université Paris-Dauphine, Ecole des Mines de Paris
This one-year Master Programme (level M2), which has
been existing and evolving for about 40 years, is devoted
to Decision Aiding and Operational Research.
Starting next academic year (2014-2015), courses will be
taught in the English languageand the programme will be
organized around three main streams. In particular, the «
Decision » stream includes courses such as Decision
Theory and Game Theory, Multiobjective Optimization,
Robustness in Operational Research and Decision Aiding,
Algorithmic Decision Theory and Computational Social
Choice.
Tuition fees are around 500 euros per year.
More information about the programme including the
application procedure can be found at
http://modo.dauphine.fr/en/master-program.html

Any inquiries about the master can be addressed at master-
modo@dauphine.fr

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

 Books

Multicriteria Analysis in Finance
By Doumpos, Michael, Zopounidis, Constantin, Springer
2014.

This book provides a concise introduction into the
fundamentals and applied techniques of multiple criteria
decision making in the finance sector. Based on an analysis of
the nature of financial decisions and the general methods of
financial modelling, risk management and financial
engineering, the book introduces into portfolio management,
banking management and credit scoring. Finally the book
presents an overview of further applications of multi criteria
analysis in finance and gives an outlook on future
perspectives for the application of MCDA in finance.

http://www.springer.com/business+
%26+management/operations+research/book/978-3-319-
05863-4

**Optimization in Engineering Sciences: Approximate and
Metaheuristic Methods**

By Dan Stefanoiu , Pierre Borne, Dumitru Popescu, Florin
Gheorghe Filip, Abdelkader El Kamel, Wiley, 2014.

The purpose of this book is to present the main metaheuristics
and approximate and stochastic methods for optimization of
complex systems in Engineering Sciences. It has been written
within the framework of the European Union project ERRIC
(Empowering Romanian Research on Intelligent Information
Technologies), which is funded by the EU's FP7 Research
Potential program and has been developed in co-operation
between French and Romanian teaching researchers. Through
the principles of various proposed algorithms (with additional
references) this book allows the reader to explore various
methods of implementation such as metaheuristics, local
search and population based methods. It examines multi-

objective and stochastic optimization, as well as methods and tools for computer-aided decision-making and simulation for decision-making.

http://eu.wiley.com/WileyCDA/WileyTitle/productCd-1848214987.html

Weighting Methods and their Effects on Multi-Criteria Decision Making Model - Outcomes in Water Resources Management

By Noorul Hassan Zardari, Kamal Ahmed, Sharif Moniruzzaman Shirazi, Zulkifli Bin Yusop, Springer, 2014.

This book provides a systematic way of how to make better decisions in water resources management. The applications of three weighting methods namely rating, ranking, and ratio are discussed in this book. Additionally, data mining on keywords is presented using three popular scholarly databases: Science Direct, Scopus, and SciVerse. Four abbreviated keywords (MCDM, MCDA, MCA, MADM) representing multi-criteria decision-making were used and these three databases were searched for different popular weighting methods for a period of 13 years (2000-2012). The book provides also a review of weighting methods applied in various multi-criteria decision-making (MCDM) methods and also presents survey results on priority ranking of watershed management criteria undertaken by 30 undergraduate and postgraduate students from the Faculty of Civil Engineering, Universiti Teknologi Malaysia.

http://www.springer.com/earth+sciences+and+geography/earth+system+sciences/book/978-3-319-12585-5

Multicriteria Decision-Making: Systemic Approach

By Al'bert Voronin, LAP LAMBERT Academic Publishing, 2014.

Modern society places high and often conflicting demands on the quality of decisions in various subject areas. Dramatically increases the cost of failure in solutions. Therefore over the last few years fading are intuitive methods of decision-making and management. For this purpose science-based theoretical and practical models and methods are developed. The concept is proposed and apparatus of nonlinear compromise scheme is developed allowing formally obtain Pareto-optimal solutions, adequate to the appropriate situations. The principle of rational organization and a non-local approach to solving optimization problems is described. Several applications are presented that help the reader digest some of the

intricacies in the methodology. The book should be especially useful to scientists and professionals involved in the multicriteria decision-making, as well as to students in related disciplines or anyone else who may be considering the multicriteria decision-making

http://www.abebooks.com/9783659549939/Multicriteria-Decision-Making-Systemic-Approach-Voronin-3659549932/plp

Introduction to the Analytic Hierarchy Process

By Matteo Brunelli, Springer, 2015.

This book provides a concise, yet self-contained, introduction to the AHP that uses a novel and more pedagogical approach. It begins with an introduction to the principles of the AHP, covering the critical points of the method, as well as some of its applications. Next, the book explores further aspects of the method, including the derivation of the priority vector, the estimation of inconsistency, and the use of AHP for group decisions. Each of these is introduced by relaxing initial assumptions. Furthermore, this booklet covers extensions of AHP, which are typically neglected in elementary expositions of the methods. Such extensions concern different numerical representations of preferences and the interval and fuzzy representations of preferences to account for uncertainty. During the whole exposition, an eye is kept on the most recent developments of the method.

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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).

Contact: José Rui Figueira (figueira@ist.utl.pt)

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
(Milosz.Kadzinski@cs.put.poznan.pl)

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.