P1	P2	P3	P4	P5	P6	P7	P8	**Weight**
8	10,5	4	4	11	11	4	0	**0,2**
8	12	5,5	8	12	12	10	4	**0,3**
8	12	8	10	12	12	10	9	**0,1**
15	15	13	13	12	12,5	13	14	**0,1**
16	20	14	15	17,5	16	16	16	**0,3**
11,1	14,4	8,75	10	13,45	13,05	10,9	8,3	

Table 10. Weighted Sum Application on Project Data

Result : P8 $\precsim$ P3 $\precsim$P4 $\precsim$P7 $\precsim$ P1 $\precsim$P6 $\precsim$P5 $\precsim$ P2

In the particular case, where the weight set is equal to (1, 0, 0, 0, 0), the OWA function corresponds to the min operator.

In the particular case, where the weight set is equal to (0, 0, 0, 0, 1), the OWA function corresponds to the max operator.

3.3.7- Choquet integral

The Choquet integral is an aggregation function applying a non-additive model contrary to the previous functions. It is defined by the following relation:

$$\begin{cases} \forall(x_1, \dots, x_n) \in X, C(x)= u(x_1, \dots, x_n) = \sum_{i\in N} w_{\{i,\dots,n\}}(u_i(x_{T(i)}) - u_i(x_{T(i-1)})). \\ x \succsim y \Leftrightarrow \forall\, i \in N, u_i(x) \geq u_i(y) \\ \text{avec } T(i) \text{ une permutation telle que } u_i(x_{T(i)}) \leq u_i(x_{T(i+1)}) \text{ et } u_1(x_{T(0)}) = 0. \end{cases}$$

Example: considering the following data:

- The subset consisting of four projects: P1, P4, P7, P8;
- The criteria: C1, C2, C3, C4 and C5;
- And the following weight set:

{0}= Ø
{1} = 0.2, {2} = 0.3, {3} = 0.1, {4} = 0.1, {5} = 0.3,
{1,2} = 0.5, {1,3}= 0.3, {1,4}= 0.3, {1,5}= 0.5,
{2,3}= 0.4, {2,4}= 0.4, {2,5}=0.6,
{3,4}= 0.2, {3,5} = 0.4,
{4,5}= 0.4,
{1, 2, 3}= 0.6, {1, 2, 4}= 0.6, {1, 2, 5}= 0.8,
{1, 3, 4}= 0.4, {1, 3, 5}= 0.6,
{1, 4, 5}= 0.6,
{2, 3, 4}= 0.5, {2, 3, 5}= 0.7,
{2, 4, 5}= 0.6,
{3, 4, 5}= 0.5,
{1, 2, 3, 4}= 0.7, {1, 2, 3, 5}= 0.9,
{1, 2, 3, 4, 5} = 1.

$C(P1)= C(16, 8, 15, 8, 8)= 8+w_{\{1, 3\}}(15-8) + w_{\{1\}}(16-15) = 10.3$

$C(P4) = C(13, 15, 10, 4, 8) = 4 + w_{\{1, 2, 3, 5\}}(8-4) + w_{\{1, 2, 3\}}(10-8)+ w_{\{1, 2\}}(13-10) + w_{\{2\}}(15-13) = 10.9$

$C(P7) = C(10, 10, 13, 16, 4) = 4 + w_{\{1, 2, 3, 4\}}(10-4) + w_{\{3, 4\}}(13-10) + w_{\{4\}}(16-13) = 4 + 0.7*6 + 0.2*3 + 0.1*3 = 9.1$

$C(P8) = C(9, 16, 14, 0, 4) = w_{\{1, 2, 3, 5\}}4+ w_{\{1, 2, 3\}}(9 -4) + w_{\{2, 3\}}(14-9)+ w_{\{2\}}(16-14) = 0.9*4+ 0.6*5+0.4*5+0.3*2 = 9.2$

Result : P7 $\precsim$ P8 $\precsim$P1 $\precsim$P4

3.3.8- Conclusion on MAUT methods

We note that the results obtained are different depending on the method used and the intended purpose. Although the MAUT approach highlights a wide variety of easily comparable numerical solutions and uses fairly simple computational methods, it is still complex for the decision-maker to visualize what utility is associated with. performance given on each criterion and give a total pre-order. In addition, it is a totally compensatory method, that is to say that the bad score of an action on a criterion can be completely compensated by its good score on another criterion which complicates the interpretation results obtained.

4. Comparative of the two categories

The table below summarizes the advantages and limitations of each type of these methods.

MAM Categorie	Advantages	Limitations
Outranking method	- A more elaborate structure based on a reflexive relationship, - it inform the decision-maker about his choice; the actions to be eliminated and those to be kept (but incomparable between them), - Most outranking methods construct the overclass relationship based on two concepts of concordance and non-discordance.	- structure preferably developed progressively on the basis of less rich information (absence of pre-orders), - acceptance of the idea of the incomparability of actions, which often leads to a more in-depth study with the aim of reducing or clarifying all the actions and all the criteria, - Does not solve the problem of decision-making, - The outranking relationship has no particular properties other than reflexivity. As a result, outranking methods will first have to build this relationship and then use it to answer the chosen problem.
Utility Theory	- Production of a total pre-order, - The result is very rich, based on the wealth of hypotheses of the theory, - Produce a function that can store all the actions from the best to the least good: Large varieties of solutions put forward according to the method used, - Possibility to have the decision-maker describe this function via a set of numerous and sometimes-difficult questions concerning the intensities of his preferences and the weightings of the criteria and / or the substitution rates between criteria.	- Need a lot of information (values and parameters) -Additional methods: compensatory. -Delicate interpretation of the parameters, -A sensitivity analysis should be conducted systematically, to release the only robust information, but this is rarely done.

Table 11. Advantages and limitations of outranking method and utility theory

5. Conclusion:

All multi-criteria decision support methods have the advantage of being able to make a decision based on multiple criteria and not on the basis of a single criterion (profit for example). Beyond this observation, the results obtained are different from one method to another.

Thus, the choice between Utility Theory (MAUT) and outranking method must be done according to the advantages and limitations of these broad categories of multicriteria analysis methods (MAM). Indeed, MAUT has the advantage of being easier to use but its compensatory character makes the interpretation of the results difficult. Unlike the ELECTRE method, which is more difficult to apply, but it helps to inform the decision-maker about his choice between the actions or projects to be kept and those to be eliminated but doesn't solve the problem of decision-making itself.

This is why the use of other methods is still necessary to complete the decision-making process. For example, the AHP (Analytic hierarchy process) which allows to hierarchically structure a complex, multi-criteria, multi-person and multi-period problem. This method is used for decision making in complex situations where human perception, judgments, and consequences have long-term implications (Bhushan and Rai, 2004). Thus, the combination of several methods remains possible.

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Biographies

Houda Tahri is an IT engineer from Mohammadia School of Engineers (EMI) with a long experience in IT project management. She held the position of Head of IT department at ISCAE (the Higher Institute of Commerce and Business Administration) where she participated in the QMS certification workshops, awareness and training of ISCAE staff. Later, she held the position of Head of Engineering Department at ONEE (National Electricity and Water Company) where she developed a rich experience in project management with different types of stakeholders. She has maintained her skills through advanced training, active and renewed PMP certification (PMP #1315392), and doctoral studies in project management. As a PhD candidate at IMOSYS Research team (Engineering, management and optimization of systems) at EMI (Mohammadia School of Engineers), she has presented and published several research papers, in Morocco and internationally. Its areas of research mainly concern IT Project Management, Project Management Maturity, Mathematical optimization methods in project portfolio management, Design of an integrated system for project management, project management maturity of Moroccan organizations and the last one with IEOM in 2017 "The new Project Management Maturity Mixed Model (P4M) and the OPM3: Case of a PMO implementation".