Using Prospective Vision and Multi-Criteria Decision Analysis with Scenario Planning

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ABSTRACT

Multi-criteria Decision models, and approaches which are based on Scenario Building, are some of the most outstanding approaches used for strategic decision-making. In spite of the advances achieved already in these two fields, no apparent in-depth research has been done in the aspects of integration between them. With the goal of bridging this gap, this paper proposes the use of a hybrid model based on concepts of scenarios and the use of the Utility Theory and Scenario planning. This proposed model is applied to a situation containing five alternatives, evaluated by five criteria, with a prospective vision of three scenarios. The results obtained, indicate that the traditional approach of multi-criteria decision-making, which only factors in a single vision of scenarios, may result in less than robust suggestions for the decision-maker.

KEYWORDS. Scenarios, Multicriteria,Prospective.

ADM - Multicriteria Decision Support // ADM - Apoyo a la Decisión Multicriterio // ADM - Apoio à Decisão Multicritério

1.0 INTRODUCTION

The process of decision analysis involves a variety of alternatives, which must be carefully evaluated so that the "best" decision can be chosen. In order for the decision making process to be both effective (to solve the problem) and efficient (to solve it in the "best" way), it is important to have accurate information about the implementation process (Bazerman, 2006). As decisions are set in motion, decision-makers (DM) must be convinced that the analysis process was conducted properly and thoroughly, in order to enable the decision makers to estimate the potential outcome of their decision. Antunes and Dias (2007) emphasize that the aim of decision analysis is to provide logical methods to improve the decision making process of individuals and companies that are focusing on the development of models designed for decision making under conditions of uncertainty; and which take into account multiple objectives.

This opinion demonstrates the relevance of classical authors who have brought to light the complicated issues involved in multiple criteria analysis, such as: Arrow (1963), Roy (1985), Fishburn (1973), Saaty (1980), Zeleny (1982), Changkong Haimes (1983), Boyssou and Roy (1985) and Steuer (1986). The demand for approaches that consider multiple criteria gave rise to the development of Multicriteria Decision Aid (MCDA). Multicriteria analysis, often called multiple criteria decision making (MCDM) by the American School and multicriteria decision aid (MCDA) by the European School, is a set of methods which allow the aggregation of several evaluation criteria in order to choose, rank, sort or describe a set of .alternatives. Its principal objective is to provide the decision maker with tools that enable him to advance in solving a decision problem. The specialists in the distinguish several categories of methods in Multicriteria Decision.(Zopounidis, 1999).- Table 1 displays some of these methods.

Table 1: Methods of Multi-criteria Decision.

Method	References	Method	References
Analytic Hierarchy Process (AHP)	Saaty (1980)	MACBETH	Bana E Costa and Vansnick (1994)
Multi-attribute Utility Theory (MAUT)	Fishburn (1970), Keeney and Raiffa (1976)	Analytic Network Processes (ANP)	Saaty (1996)
		Promethee	Brans et al. (1986)
CONDORCET	Condorcet (1788)	Regime	Hinloopen et al. (1983)
COPELAND	Copeland (1951)	SMART	Edwards (1977)
ELECTRE TRI-C	Almeida-Dias et al. (2012)	Thor	Gomes et al (2008), Gomes, Gomes, Maranhão (2010)
ELECTRE III	Roy e Hugonnard (1981)	Todim	Gomes and Lima (1992), Gomes, Gomes, Maranão (2010)
ELECTRE II	Roy and Bertier (1971)	Tomaso	Marichala et al. (2006)
ELECTRE IS	Roy and M. (1985)	Verbal Decision Analysis (VDA)	Larichev and Moshkovich (1997)
ELECTRE IV	Roy and Hugonnard (1981)	VIP Analysis	Clímaco et al. (2009)
ELECTRE TRI	Yu (1992)	Zapros	Larichev and Moshkovich (1995)
ELECTRE I	Roy (1985)	BORDA	De Borda (1781)

MCDM, the field of operational research (OR) that deals with problems that involve multiple criteria, provides the sound methodological basis to resolve the inherent multicriteria nature of portfolio selection problem(Xidonas et al, 2011). Additionally, when making a decision, it is to be understood that some assumptions will be made, mainly regarding the scenario in which the decision is reached, as well as in the scenario in which it will be implemented. This factor gave

birth to a new set of approaches for decision support, which together make up the Scenario Building for Decision Making model. In regards to the scenario analysis methods, Godet (2000) states that in effect, there is not just one single method for developing scenarios, but rather a variety of methods; some of which are simple, and others more elaborate. Nonetheless, the author points out that a consensus has been reached that the term "scenario method" only applies to an approach which includes a number of specific interrelated steps,-- i.e. systems analysis, retrospective analysis, actors' strategies, and scenario development. Table 2 presents a summary of the set of existing techniques in this context.

Table 2: Methods for building scenarios for multi-criteria decision-making

Method	References	Method	References
Intuitive logics	Schwartz, 1998	Future Mapping	Mason, 1994
Prospective analysis	Godet, 2000a	Trend impact analysis	Boroush, Thomas, 1992
Basics	Georgantzas, Acar, 1995	Global Business Network (GBN) methodology	GBN, 1998
Delphi method	Dalke, Helmer, (1963)	Morphological analysis	Godet, 2000
		Interax	Huss, Hoton, 1987

It has been noted that the decision-making models based on multi-criteria methods, generally, only take into account the situation or scenario in which the decision is made. On the other hand, it is also possible to observe that scenario-building methods do not usually make use of more than one variable analysis. What helps bridge the gap within this context, is the building of decision support methods, which simultaneously take into account both multiple scenarios and multiple criteria.

1.1 Project Rationale and objective

In order to avoid some of the problems listed by the authors in Table 1, such as: overly optimistic results due to there being only one future scenario envisioned; and hastened results, due to not being able to establish more than one future possibility, etc., intuition is used as an additional factor to aid in the scenario planning and to emphasize the importance of the decision-maker in the decision-making process, as per the authors' proposals in Table 2. This article aims to present the development of a model in which multi-criteria decision-making is performed by using prospective vision of scenarios.

The integrated use of scenario planning and multicriteria decision analysis (MCDA) has been advocated as a powerful combination for decision support in strategic decisions. The two methodologies seem to play a complementary role with each other. Scenario Planning (SP), a widely employed methodology for supporting strategic decision making, employs the use of imaginary future scenarios to help decision makers think about the main uncertainties they face, and devise strategies to cope with those uncertainties (Montibeller et al, 2006).

Stewart et al (2013) propose using a solving scale between the criteria (C) and the scenarios (S),--and from the criteria and scenario,--propose using the Meta-criteria (C divided by S) to compare the alternatives. The present proposal suggests assigning different weights to the criteria in different scenarios, and it proposes,--as an out-of-the-box approach, by applying it to the result of ordering the alternatives in each scenario, as a way to establish decision rules and to support the choice of an alternative, or a group of alternatives, resulting in better performance in all the scenarios being studied. This proposal broadens the Trutnevyte et al (2012) model, which suggests creating future visions based on the actors involved, and classifying the criteria in these visions; this proposal suggests both:

• The development of scenarios adopted from a methodology for scenario building; this line of research is summarized in Table 2

• classifying the alternatives by criteria by scenario, with different weights for criteria for scenario.

The methodologies described in table 2 suggest that the number of scenarios should be from three to five, the reason being, that more would reduce uncertainties rather than increase

uncertainties. This study uses three scenarios, and thus, this study differs from the proposal of Trutnevyte et al (2012) which proposes future visions in a number greater than the five scenarios suggested in research literature, in findings, and in real life applications.

1.2 Summary of Methodology and Outline of the Article

In order to reach the objective, the procedure will be done in stages using a multi-criteria decision-making process, where the choice of the best alternative is influenced by the prospects of the scenarios Stages:

a) Studying and characterizing of the problem.
b) Identifying of the solution alternatives
c) Prospecting of scenarios and identifying of the criteria
d) Estimating criteria weights in each scenario
e) Evaluating the performance of each alternative in each criterion
f) Processing using the algorithm of aggregation, determining the usefulness of each alternative in each scenario.
g) Coming up with the ranking of the alternatives in each scenario and identifying the most robust alternatives when considering the set of scenarios.

The structure of this article, aside from this introductory section, is composed of: Section 2, which features the description of the Multicriteria Decision characteristics; Section 3, which describes the main characteristics of the prospective scenario construction techniques; Section 4, which presents a proposal for the integration of Multicriteria Decision with prospective vision, and Section 5, which presents the main conclusions of this research.

2. MULTI-CRITERIA DECISION

The multi-criteria methods have been developed to support and guide DM in the evaluation and selection of alternative solutions in different spaces. The decision variable space consists of, particularly, the set of feasible and non-feasible decision alternatives that are available for a given problem. Criteria are attributes that can be quantified or assessed, and which contribute to the decision. The search for a solution to a problem often occurs in an environment where the criteria are conflicting, i.e., where the gain of one criterion may result in the loss of another. These criteria can be the factor type, which are made up of variables that enhance or detract from the suitability of a specific alternative for the objective in question, or, may be the constraint type; variables that limit the alternatives considered in the analysis, excluding them from the set of possible solutions. The models based on multi-criteria decision are recommended for problems where there are several evaluation criteria to consider. Multicriteria Decision can also be defined as a set of techniques which are designed to search for a number of alternatives within multiple criteria and conflicting objectives. A multi-criteria approach features the following advantages, (Climaco, et al, 2009):

• Creates a platform for dialogue between analysts and decision makers who make use of common viewpoints;
• Provides an easy way of incorporating uncertainties about the data on each point of view;
• Enables facing each alternative as a commitment between conflicting objectives. This argument highlights the fact that there is rarely a situation in which an alternative is found that is superior to all the alternatives remaining on every point of view.

When it comes to multi-criteria problems, it is important to clearly define the goal and purpose of the analysis. Classically, there are three main problematic issues in multi-criteria situations: sorting, choosing, and ranking.Multi-criteria methods can be divided into three main approaches in regards to the principles of modeling preferences:

a) Single synthesis criterion approach consists of bringing together different points of view within a single synthesis function, which can be subsequently optimized. In this case, the conditions of aggregate functions and model building should be studied. The Multi-Attribute Utility Theory (MAUT) is cited as an example.

b) Outranking Approach (sometimes known as the French, or European, School of decision-making), first of all supports constructing outranking relations in order to represent the DM' preferences. The next step consists of exploring outranking relations in order to help decision-makers solve the problem. Some examples are the ELECTRE family methods. Often, methods which contain approaches for overcoming are used in order to select a subset of a finite set of alternatives, or to rank order them. Mainstream methods do not allow the unlimited compensation of "large disadvantages" and in addition, they take into account the fact that small differences between evaluations of the alternatives are not always significant. (Gomes, Lima, 1992) (Gomes, Gomes, Maranhão, 2010).
c) Interactive Judgment Approach: methods that use a trial and error approach and that use multi-objective mathematical programming structures. The continuous methods are also called multi-criteria optimization methods or interactive methods, which basically involve mathematical optimization methods for problems involving more than one objective function. The approach to problem solving under the multicriteria focus, is not intended to provide DM with a solution to their problem, but rather, chooses a single truth represented by the selected action. It aims to aid the decision-making process by recommending actions or courses of actions to those who will make the decision. If the quality of available information throughout the process of solving a complex problem is of unquestionable importance, it serves as the type of analytical handling of that exact information. Multicriteria methods help clarify the decision making process and seek to incorporate the value judgments of the agents, with the intention of monitoring the way preferences are developed, and with the goal of recognizing the process as a learning process. The multicriteria methods help DM to understand and explicate their preferences alongside the alternatives. In this sense, we seek to build models that legitimize the elaboration of value judgments, judgments which must be subjective.(Gomes, Gomes, Maranhão, 2010).

3.0 TECHNICAL OUTLOOK ON THE CONSTRUCTION OF SCENARIOS

Foresight is a systematic participatory process, which involves information gathering and the constructing of medium-to-long-term visions for the future, with the goal of aiding present day decision-making and mobilizing joint actions to face the future that is to come. (European Commission, 2002)(Gouveia et al, 2013). Scenario study consists of a way of dealing with situations that may arise in the future beginning with a limited, but structured list of options of events (Carvalho, 2009). Godet (2000a) explains that the analytical instruments of prospective vision are merely tools, which serve to reduce the complexity of the real systems; they cannot replace the intelligence, critical sense and collective insight of the working group. Nevertheless, these tools are useful, and are worth all of the time invested in their development. Prospective vision studies have achieved substantial progress, and are providing significant benefits and insight to those who are applying them. In prospective vision studies, it is necessary to recognize the assumptions and the cultural preferences that make up the prospective vision practices (Masini, Vasquez, 2000). Prospective vision studies, particularly those on a national scope and those inspired by the government, need to establish an effective interface with the political decision-making processes. Unlike extrapolative models, which only give a speculated estimate on how the future will unfold, and which much of the time, are based solely on the past (past data and historical data), Scenario Methodology creates a "range of options" based on current trends and on the amount of uncertain events which the organization needs to deal with (Grupp, 1996). It is not about ignoring the past and the extrapolation of the data, but rather, of using it to look into other possible future scenarios.

The scenario methodology becomes an interesting alternative, because it does not examine the situation in a biased manner, assuming that everything will continue as it is in the coming years (Carvalho, 2009). The notion of a scenario is general enough to cover a number of approaches, which can be classified according to the perspectives they take on scenario construction (Bunn, Salo, 1993). The nomenclature and the emphasis and order of the stages of scenario building vary from author to author, and in general, the methodologies take the following path: (Carvalho,

2009):a) Definition of objectives; b) In-depth investigation, analysis and description of the relationship of the variables; c) Logging in of the value of the variables and verification of their consistency; d) Defining of the main theme of each scenario based on the main variations identified; e) Constructing of the narrative of at least two scenarios: one of reference and one of contrast. The scenario can be constructed once the identification of trends and uncertainties to assist managers in decision-making occurs.
Johnston (2000) identifies the following common viewpoints on prospective studies: a) The future is unpredictable; b) A prospective action must not only have as its objective the providing of information, but also the changing of mindsets; c) The process is as important as the outcome; d) There is no simple correlation between program objectives and prospective methods; Adherence to higher levels of authority, or a defender of the program, is critical to obtaining successful results; e)Measuring the effectiveness of the prospective program is ideal, however, is extremely difficult. Anticipatory scenarios are built by searching for the possible causes which could lead to a given future state (Bunn, Salo, 1993).

3.1 Planning with scenarios

According to Schoemaker's vision (1995), scenario planning is a structured (disciplined) methodology used to envision future possibilities. The author emphasizes that, among the various methodologies for thinking about the future, scenario planning stands out for its ability to capture a wide range of possibilities and a large wealth of details. The scenarios are built from realistic combinations of key driver values, which are constructed into fully-fledged narratives by enriching them with information about the dependent variables, the specific events, and the interactions between the many scenario elements (Bunn, Salo, 1993).
According Schwartz (1998) scenario is a tool used to arrange a person's perception regarding future alternative environments in which the outcome of their vision will play out. The name "scenario" is derived from the theatrical term "scenario", the script for a play or movie. According to Schwartz (1998), scenarios first appeared after the Second World War, as an approach used for military strategizing. Porter (1992) describe scenario like a viewpoint that is based entirely on what the future could end up being, and with the forming of multiple scenarios, a company can systematically extrapolate the possible outcomes of uncertainty for their strategic choices (Dane, Pratt 2007).
Scenario is a tool used to sort the perception of alternatives for the future environment, given that, decisions made today will affect the future (Schwartz, 1998). It resembles a collection of stories, written or spoken, around a carefully constructed plot. In order for the scenarios to be drawn up, the scenarist, therefore, must consider a set of forces that act on the system in question. Uncertainty is a fundamental element to take into consideration when deciding on the use of the tool. Godet (2000) defines prospective scenario as "the set formed by the description of a future situation and the course of events that enables one to progress from the original situation to the future situation". The author supplements his definition by including that, a scenario is not the reality of the future, but a means of representing it, with the goal of guiding present action in light of possible and sought-after futures. Spers and Wright (2006) state that the study of scenarios allows for the mapping out of different paths, which take into account that which individuals believe they know about the future, including events considered to be uncertain in a specific time horizon. For the authors, scenario planning is not an exercise in prediction, but an effort to make consistent and plausible descriptions of possible future situations. Even though it is a partial and imperfect representation of what is to come, this tool should encompass the main aspects of the problem that are in need, in order to aid, at present, the decision making process that will secure future objectives.
Turner (2008), the use of scenarios causes the organization to think systematically and strategically about the variety of potential outcomes, without the influence of their own inclinations, opinions and preconceptions. For this author, scenario planning allows the organization to reflect on and rehearse the possibilities of tomorrow, and to avoid complacency or fear of changing something that is currently a favorable situation. Schoemaker (1995) points out

that the scenario methodology can be employed in any situation of uncertainty, because it is used to identify early-warning signals, to evaluate the robustness of the core competencies of the organization, to generate better strategic options, and to evaluate the risk/returns of each option. According to the author, the use of scenarios is suitable under the following conditions: a) When there is a high level of uncertainty in regards to the ability to study the future; b) When a number of surprises have occurred in the past; c) When there is possibility of there being new opportunities which were not foreseen or generated; d) When an inferior quality of strategic thinking is detected; e) When the company is in need of a common language without losing its diversity; f) When there are various differing opinions. Scenario analysis, when applied to scenario planning, results in descriptions of alternative futures, based on which the decisions of today should be made.

They are not forecasts or strategies; but rather, different evolutionary hypothesis that are designed to focus on specific risks and opportunities involved in the various development strategies. (Fahey, Randall, 1998). Developing scenarios is not an exercise in prediction, but rather, an effort to make consistent and plausible descriptions of possible future situations, featuring the determining factors between the current situation and each future scenario, highlighting the factors relevant to the decisions that need to be made (WRIGHT , Spers, 2006). A key element that needs to be considered when deciding to use the tool is the element of uncertainty. They must consist of internally coherent views of future possibilities (often in the form of stories) which will be useful to predict the implications of uncertain developments, helping the participants of the decision making process to organize their thinking in regards to what would be the desired course to take to respond to the conjuncture represented by the scenario, with the ultimate goal of increasing robustness in the policies and development strategies that will be adopted (European Commission, 2002). In a world full of increasing uncertainty, scenario methods provide an optimized “way of thinking" about a great variety of potential outcomes of variables that can impact the future of an organization. (Carvalho, 2009).

According to Ackoff (1970), the essence of “business wisdom” is being mindful about the future of businesses. Understanding it and controlling it is the big challenge for companies, especially in the age of knowledge, because when we talk about the future, we think of scenario. Therefore, the importance of planning with scenarios is confirmed. When planning using scenarios, you stay “a step ahead” of the more traditional planning methodologies, because the uncertainties are incorporated into constructing of the future. Developing scenarios is not an exercise in prediction, but rather an effort to make consistent and plausible descriptions of possible future situations, featuring the determining factors involved in the path between the current situation and each future scenario, highlighting the factors relevant to decisions that must be made (WRIGHT , Spers, 2006). Scenarios are working tools that provide guidance for companies and governments, since they serve as a point of reference for the analyzing of alternatives and for subsequent decision making towards a strategic objective. At this point, we identify a clear synergy between multicriteria and the study of scenarios. Although they may avail themselves of different scopes and future horizons, scenarios are generally used for the formulating of long-term options, so as to contribute to the establishing of a united vision in regards to the business and objectives to be achieved, taking into account the conjectural difficulties and the restrictions of a short-term vision (Schwartz, 1998). Prevision and prospection are not the same thing. Projection techniques are used for the identification of probable futures. Prospection pertains to the search of future possibilities and their prevision. (Table 3).

Table 3 - Prevision and Prospection Source: European Commission 2002

Prevision	**Prospection**
Focuses on the certainties and conceals the uncertainties	Focuses on the uncertainties legitimizing their presence
Originates from a single projection.	Originates from diverse, but logical, images of the future
Gives preference to continuity	Gives preference to rupture considerations

Qualities' influence is minimal	Seeks to align the qualitative with quantitative
The prediction may hide risks	The various "futures" cause the risks to show
Can generate inertia	Gives preference to flexibility
Begin as simple models and then become complex	Is part of future, is complex, seeks simplification.
Can generate a **se**ctoral approach	From the beginning, it adopts a comprehensive approach.

The building of future scenarios holds considerable methodological challenges. The "modelling" of future scenarios has become a commonly used tool for intelligence agencies, both civil and military, for governments endowed with strategic thinking, and for large companies – not to mention the countless scientific applications in diverse fields, such as metrology, astronomy, environmental science, economy, marketing, finances and demographics. (Polesi, 2006). In future alternative conditions, it is possible to identify a relatively small number of possible futures and distinctions. This level of uncertainty requires the development of different scenarios, each of which may require a specialized evaluation. After defining the degree of likelihood of each of those futures occurring, it is possible to use a classic framework of decision analysis to channel the risks and returns inherent to strategic alternatives. The ability to look towards the future and "direct it" is part of the context of planning in organizations, and as some authors have noted (Porter, 1992; Godet, 2000a; Schwartz, 1998), the use of prospective scenarios is one of the most appropriate tools for the defining of strategies in turbulent and uncertain environments. With the building of multiple scenarios, a company can systematically explore the possible consequences of these uncertainties regarding its strategic options. Scenarios compel managers to think about the future by taking into account what it could be and not "what it will be".
Scenarios represent an understanding that is vital to guide strategic decision-making. (Godet, 2000). It is a means of enhancing the ability to visualize alternative futures. Some organizations use scenarios as tools to understand the strategic implications of uncertainties. With the construction of multiple scenarios, a company can systematically explore the possible consequences of those uncertainties regarding its strategic options. Selecting the method of building scenarios and integrating it into the company's strategic process is an arduous task, which requires profound knowledge and commitment. The choice of methods will depend on the specific characteristics of each company, in other words, the strategic decisions, the work environment, the organizational culture, the time available, and the investment and expected outcome. It should be noted that the models are rarely used on their own, and often, they are combined. Johnston (2000) states that the authors of prospective studies have found that the organizations had a number of set objectives for prospective studies, ranging from "creating an early warning signal" to "building consensus". However, three main themes stood out: a) Generating information that contributes to the process of decision-making; b) Motivating people to reflect on the future; c) Bringing people together, in order to form a collective or shared vision of the future.

4.0 INTEGRATION OF MULTICRITERIA -PROSPECTIVE VISION: PROPOSAL AND SAMPLE OF ITS APPLICATION SCENARIO PLANING

In this section we present a unique proposal regarding the integration of multicriteria concepts and the technical prospective of scenario building. More specifically, in the context of multicriteria, the use of an additive method is recommended. The system is structured on the implementation of the following steps:

a) Following is an example problem with the proposed application applied to it.
b) This is an example problem, in which five alternatives, three scenarios and five criteria in each scenario are taken into consideration.
c) In this situation, five alternatives classified by a1, a2, a3, a4 and a5 are taken into account.
d) In this situation, three scenarios are considered. These scenarios were built based on the Methodology prospective analysis technique:

- Scenario 1 – Trends – a few modifications will occurs in the future
- Scenario 2 - Desirable / Optimistic – the governors will change the probabilities
- Scenario 3 – Pessimistic – all the pessimistic possibilities will occur

4.1. Estimating of the weights of each criterion in each scenario

Table 4 displays the weights assigned, in this situation, to the criteria in each of the scenarios. Given that it is dealing with an example problem, a more in-depth argument regarding the process of how the weights were assigned is not included.

Table 4. Weights of criteria for each scenario

	Criteria Weights per Scenario				
Criteria	c1	c2	c3	c4	c5
Scenario 1	1	2	3	4	5
Scenario 2	5	5	3	2	2
Scenario 3	1	1	3	4	4

At this stage, the expected performance for each alternative in each scenario must be estimated. Table 5 displays the performance associated with each alternative, in light of each criterion considered in each one of the scenarios.

Table 5 – alternatives categorized in each criterion in each scenario

Alternatives	**c1**	**c2**	**c3**	**c4**	**c5**
a1 scenario 1	5,0	4,0	5,0	3,0	5,0
a1 scenario 2	5,1	4,1	5,1	3,1	5,1
a1 scenario 3	2,5	2,2	2,3	2,2	3,5
a2 scenario 1	4,1	5,0	3,0	5,0	4,0
a2 scenario 2	4,8	5,4	3,3	5,4	4,3
a2 scenario 3	2,3	2,3	3,9	3,9	2,3
a3 scenario 1	3,0	3,0	5,0	5,0	3,0
a3 scenario 2	3,3	3,3	5,5	5,5	3,3
a3 scenario 3	2,5	3,0	1,8	3,0	2,4
a4 scenario 1	4,0	4,0	4,3	4,3	4,0
a4 scenario 2	4,3	4,3	4,8	4,7	4,3
a4 scenario 3	2,4	2,4	2,6	3,0	2,7
a5 scenario 1	4,0	3,9	4,2	4,2	3,9
a5 scenario 2	4,2	4,2	4,7	4,6	4,2
a5 scenario 3	2,4	2,4	2,4	2,9	2,6

4.2 Processing by using an MAUT algorithm of additive utility to establish the attractiveness in each scenario.

The usefulness of an alternative aj in each scenario is obtained in accordance with the equation:
$aj = \sum w_i * g_i(aj)$, for i ranging from 1 to 5
Where: wi = weight of criterion I; gi (aj) = the degree or performance of aj in the criterion i.
Table 6 (which displays the utility achieved by each alternative in each of the scenarios considered) is put together by applying this equation to the data of the example problem

Table 6 – Attractiveness of the alternatives by scenarios

Alternative	**Attractiveness scenario 1**	**Attractiveness scenario 2**	**Attractiveness scenario 3**

a1	65	77,7	34,4
a2	63,1	80,3	32,5
a3	59	67,1	41,1
a4	62,1	75,4	35,4
a5	60,7	73,7	34

4.3 Establish the ranking of the alternatives in each scenario and identify the robustness of the suggestions

Based on the results presented in Table 6, it is possible to observe that:

For scenario 1 obtain: a1> a2> a4> a5> a3 •

For scenario 2 obtain: a2> a1> a4> a5> a3

For scenario 3 obtain: a2> a4> a1> a5> a3

From these observations, we can conclude that:

We can define two sets, Set A and Set B, where set A dominates set B, when evaluating the development of set A, formed by the alternatives that are among the top three in all scenarios. The approximation of set are A are the alternatives {a1,a2, a4}, because they belong to the top three positions in the three rankings. The other alternatives are at Set B.

It is possible to observe alternative a2 is the best alternative in two scenarios (2 and 3), and the second in scenario 1. Alternative a4 is the second in three scenarios and the third in one scenario. Alternative a1 is the best in one scenario, the second in other, and the third in another. The decisor maker can choose the alternative a2.

5. CONCLUSIONS AND FUTURE STUDIES

This article seeks to incorporate the concept of prospective vision to the framework of Multicriterua decision-making. The DM should not focus on just one scenario and base their entire decision-making process on that alone. The decision-making process should consider the constant monitoring of the environment, and decision makers must be ready to change their decisions when faced with a newly formed scenario. In order to facilitate and expedite the decision-making process, the results of a study (on the best scenario that is being envisioned) must be ready beforehand. The above project was characterized as a study centred on data from a company which holds five alternative investment options, and Table 5 was created based on real data, which made it possible to apply Multicriteria Methodology.

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