



Integrated Model of Problem Structuring and Multicriteria Group Decision Making for Social Sustainable Development

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Abstract

Many social decisions in the real world are characterized by deep complexity, not only in terms of economic aspects, but also dealing with sustainability policy problems. Indeed, the emphasis to find a solution by representing the situation and its relationships in a decision problem only mathematically, focused simply in restricts views, is not enough. Nowadays, to make a social decision is imperative to promote a group discussion to find a sustainable solution and to input more emotional arguments into the problem. However, although there are several methods of problem structuring (soft OR) and methods to evaluate the problem (hard OR), there are still few works dealing with the integration of these two approaches. This paper proposes a group decision model, integrating tools of problem structuring and multicriteria evaluation. The problem structuring approach is used to facilitate and to share information starting from the participative development, as a way to generate alternative ideas of solution and to improve the learning process among all the involved members. The multicriteria evaluation is used to find a global solution for the problem, incorporating the points of view of all members involved in the decision process. The purpose of this model is to generate a richer and more effective way of handling the problem situation.

Keywords: *Soft System Methodology, Multicriteria, Sustainable development, Soft and Hard OR, Group Decision.*

Introduction

Sustainable development is a concept generated by the awareness of actual and potential conflicts between economic growth and the environment. Sometimes development and sustainable are contradictory terms, but Munda (2008) stated that sustainable development carries the ideal, of a harmonization or simultaneous realization of economic growth and environmental concerns.

Following this idea, sustainable development has a multidimensional concept that tries to balance the changes in terms quantitative of growing and qualitative for society looking for the equity distribution in the current generation and among different generations.

Nevertheless, when dealing with social problems, there is a new way of thinking about the same problems of decades ago. According to Parikh (1996), environmental concerns have come to dominate the question of appropriate technology, which has to be appropriate for the social and economic situation and also environment-friendly. However, environmentalists and engineers do not share common concepts, and sometimes they do not agree about the objectives of development. What is common is the lack of dialogue and deep discussion about the objectives of the social sustainable development problem, being expensive the wasted energy and efforts to make a decision.

In many situations related with social sustainable development problems, the governments are trying to incorporate the public opinion to obtain the social decision, which can be called participative decision. If the public interested is adequately represented, the solutions explored and finally chosen will be better, in the sense of both fairly and efficiently working toward the best interests of the society, than the solutions implemented without the involvement of the public.

Now the question is: how to incorporate the social participation in a decision making process, taking into account their perceptions and considering their arguments, instead just modeling mathematically the problem? In fact, there are several methods of soft operation research that can be used to structure the problem, and also there are several methods of hard operational research that can evaluate it. However, few studies can be found integrating both approaches. So, to contribute in this field, this paper deals a group decision making model to treat social sustainable development problems by the integration of soft and hard approaches of Operational Research. The purpose

of this model is to generate a richer and more effective way of handling the problem situation.

The soft approach was incorporated to facilitate in sharing information and to formalize the integration among the members of the group based on the participative development, applying the SSM – Soft System Methodology, with the intention of providing a learning cycle on the problem, improving all the involved participants' understanding, and then, to generate alternative ideas of solution. Besides, this approach is applied not only to allow appearing innovative alternatives to be incorporate to the problem, but also to create a favorable atmosphere for debate and discussions about the plans that were already applied, being treated positive and negative aspects and the factors that influenced in success or failure.

The hard approach is used with the problem already structured, through the multicriteria evaluation in an individual way with all the members of the group. Applying the outranking method PROMETHEE II the individual priorities are obtained.

After these two analyses, everybody has a good personal view of the decision problem and the values of the net flows obtained by the method summarize the point of view of each decision-maker. With these data, a new decision problem is then considered including n alternatives and r decision-makers ($n \times r$), being the individual net flows the assessment suggested by the alternatives with regard to decision-makers (the new set of criteria).

This paper is organized as follows. In section 2, a brief review of decision making processes of social sustainable development is shown. Section 3, presents the fundamentals of the methods used, both soft and hard approach. Section 4 shows the proposed model integrating problem structuring with multicriteria group decision making for social sustainable development, detailing all phases of the model. Section 5 summarizes the work and presents some concluding remarks.

Integrating Soft and Hard Approaches of Operational Research

According to Mingers (2000) a combination of two or more methods is called a multimethod or multimethodology. The essence of multimethodology is to utilize more than one method, possibly from different paradigms, within a single intervention (Mingers and Brocklesby, 1997). In other words, multimethodology is not a specific way of combining methods, rather, it refers

to use a plurality of methods or techniques, both qualitative and quantitative.

Mingers (2000) stated that there is a range of logical possibilities depending on whether the methods are combined in the same intervention; whether they come from different paradigms; or whether parts of methods may be combined.

Tsoukas and Papoulias (1996) said that all real problems, no matter how technical and well-defined they appear, exist within a complex context that has both social and personal dimensions, then combining methods to deal with all these characteristics should therefore be more effective.

A typical operational research model passes through several stages such as exploration and appreciation of the situation, analysis and assessment, until implementation of an action. Individual methods have their strengths and weaknesses with regard to these stages (Mingers, 2000). The contribution of this paper is in presenting a structured model to deal with social sustainable development problems, through the integration of the soft and hard approaches of the operational research. Following the approaches applied in the proposed model are briefly presented.

Soft Approach of Operational Research

According to Franco et al. (2004), problem structuring methods (PSMs) are a family of decision support methods that help the groups of several compositions to agree with a certain problem in focus and committing with a consequent action. The characteristic of those methods is the use of a model to represent alternative versions of the complex situation of common interest, combined with facilitators that help the members of the group to make constructive mutual fittings.

PSMs are more commonly used as a base for the identification or resolution of specific strategic issues or enter organizations. Rosenhead and Mingers (2004) say that what each PSM offers is a way of representing the situation that will enable the participants of the group understand better the problems, converge potentially for a mutual problem litigable or issue within of the context, and reach agreement with commitments that will solve at least partially the problem.

The complexity of the problem situation is what makes worth the use of the structuring methods. The question is how to represent that complexity



in a way that does not exclude any involved layer. In order to avoid such problems, Mingers and Rosenhead (2004) suggested the use of graphic methods. The diagrams can show in space terms the net of intriguing influences. Representations of the considerable complexity can be visualized with easiness. Even those without previous notion of the notations are frequently capable to understand the language quickly, so that they can to give suggestions of modifications for the diagrammatic model. The purpose of those representations is not to allow the consultant to find the solution, but to enable the group to engage your experiences and judgments in a more efficient way.

According to Eden and Ackermann (2006), during the last two decades, three problem structuring methods have particularly become known: *Soft Systems Methodology* (SSM), *Strategic Choice Approach* (SCA) and Strategic Options Development and Analysis (SODA).

This paper is focusing on SSM which emphasizes in the implementation of possible and desirable changes. This methodology is also known as a learning system. Such learning concerns the complex problematic of the human situation, and leads to find actions that are appropriate to the problem with the purpose of improvement of the situation, which seem sensitive to the problem in appreciation. SSM articulates the questions process that leads to the actions, but that does not conclude in that point, at least that one choose to execute them. Those actions change the situation of the problem. Consequently, the questions can continue. New ideas are lifted up and the learning, a priori, never ends. That learning or circle process can be understood as a sequence of stages, as shown in Figure 1.

Checkland (2004) argues that the participants build conceptual models of the ideal type, for each important point of view of the problem of the real world. They compare them with the perceptions of the existent system in order to generate the debate about changes are culturally possible and systematically desirable.

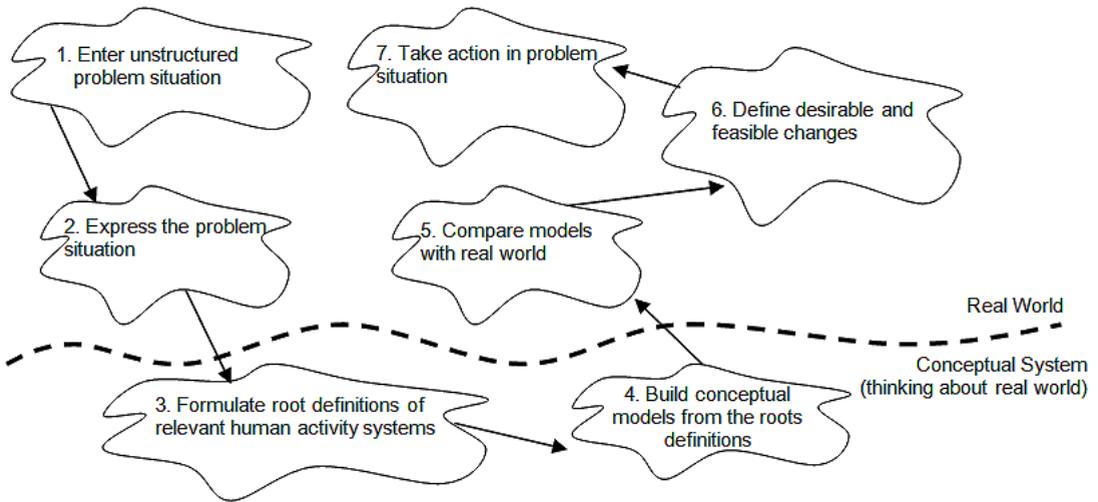


Figure 1 – Representation of the seven stages of SSM (Source: CHECKLAND, 2004)

Hard Approach of Operational Research

The relevance of the multicriteria decision-aid methodology stems from the fact that in most situations, when people are making a decision, they do not have only one objective; instead, they need to take into consideration a number of different points of view. Towards this, multicriteria methods may be used to guide the analysis by specifying the criteria involved in the decision to suggest an appropriate way to decide (Gomes et al., 2002). This methodology is a branch of a general class of operations research models, which deals with decision problems when a number of decision criteria are presented (Zopounidis and Doumpos, 2002).

There are several methods, which can be used according to the type of problem, such as choice-based, ranking-based, and sorting-based. Mixed methods can also be applied. Each method has its own characteristics. The alternatives are usually selected by making comparisons between each other with respect to each criterion, generally conflicting in most of the cases (Gomes et al., 2002).

According to Vincke (1992) and Roy (1996), the adoption of one of these methods is usually justified by arguments dictated by the nature of the problem to be analyzed. In that way, the question in focus is social sustainable development problems, which normally suffer the influence of



several decision-makers whose opinions, should be considered. Furthermore, sometimes are requested an information inter-criteria that corresponds to their relative importance. For those cases, outranking methods to rank alternatives are frequently used (Roy, 1996).

Le Téo and Mareschal (1998) stated that the basic principle of outranking is that, providing that alternative *a* performs better than alternative *b* on a majority of criteria and that there is no criterion such that *b* is strongly better than *a*, then *a* will be preferred over *b* (democratic principle of majority without strong minority).

The PROMETHEE II outranking method was adopted for use in this study. This method is software driven, user-friendly, provides direct interpretation of parameters, and a sensitivity analysis of results. Furthermore, it has as features: simplicity, clearness and stability. The notion of generalized criterion is used to construct a valued outranking relation. All the parameters to be defined have an economic signification, so that the decision maker can easily fix them (Brans et al., 1986). The PROMETHEE method is an interactive multicriteria decision making technique designed to handle qualitative and discrete alternatives (Brans and Vincke, 1985).

Comparison of both Approaches

According to Clímaco et al. (2004), at the end of the 60th decade, the traditional quantitative methods of OR could not, separately, considered appropriate to many problems, due to the growing complexity of the economic and social atmosphere and to the lack of the adoption of planning procedures and innovation management.

Following these authors, as reaction to the fragilities of the traditional hard OR, appeared the call soft OR, that pay special attention to the qualitative and remarkably subjective aspects of the decision processes. The alternatives are developed from philosophical and theoretical fundamentals and different scientific practices. That is a reflex of the current tendency of being considered that, in many cases, the group of the alternatives is evolutionary along the process of decision. The learning and, consequent, creation of new alternatives is opposed to the static vision of the set of actions, defined a priori, in the beginning of the choice process.

In a large sense, the two approaches can be compared, as shown in Table 1.

Table 1. Major comparisons between soft and hard approaches of OR (Rosenhead, 2004)

	Soft Approach	Hard Approach
Problem Definition	Complex view with inter-functions and dimensions	Direct view oriented for resolution
Development	Requires argumentations about feasible solutions and seek alternatives one.	Assumes that the alternative solutions are defined a prior
Model	A way to generate debate and insights regarding to the real world	A representation of the real world
Result	Learning process	A solution or recommendation

Kotiadis and Mingers (2006), said that the development and use of soft approach, through problem structuring methods had great success, being discussed the significant benefits of the combination of different methodologies, consisting in combining PSMs with more traditional techniques of hard OR.

According to Gomes et al. (2002), the main function of soft OR methods is to structure the problems before trying to solve them, without requesting from users a mathematical knowledge of high level. They structure events or results that the participants declare important, what turns possible to identify them, without obligatorily to associate numbers on its meanings.

Decision Making Processes for Social Sustainable Development

The biggest impulse towards public participation comes from Agenda 21, the action plan proposed by the United Nations at the Rio de Janeiro, Brazil – Eco 92. Agenda 21 aims to achieve sustainable development and a higher quality of life for all people. Besides, Agenda 21 turned possible to rethink about actions planning, opening up a way capable to build politically the bases of an action plan and a participative planning in global, national and local levels, in a gradual way, tending as goal a new economical and citizenship paradigm. As many of the problems and solutions addressed by Agenda 21 have their roots in local activities, principle 10 of the document expressly states “At the national level, each individual shall have appropriate access to information concerning the environment ...and the opportunity to participate in decision making processes” (United Nations, 1992. Rio Declaration of Environment and Development).

There is a growing development of tools to support the complex decision making processes, generally aimed at integrating multiple aspects and stimulating the public participation in decision making, and therefore the interactive and participatory use of decision support tools.

There are several studies dealing with sustainable development applying the traditional methods of hard OR (Morais and Almeida, 2007; Morais and Almeida 2006; Ülengin et al., 2001; Al-Rashdan et al, 1999; Raju and Kumar, 1999; Le Téo and Mareschal, 1998; Abu-Taleb and Mareschal, 1995.)

However, according to Eden (1995), applications of PSMs to guide decision making in practice are still less than the ones applying the traditional methods of OR. Even so, it is possible to make a simply literature review.

Brown and Macleod (1996) developed an approach against the politics of traditional natural resource management, which normally focuses on the implementation of prescriptive solutions to maximize an objective function. Thus, the authors proposed an approach that integrates the foundations of ecological balance and SSM to define options, to propose recommendations of managerial decision and to implement programs that resulted in improvements, allowing answers of the ecosystem, more realistic expectations on the part of the users and better use of the technology on the part of the beneficiaries.

Winter (2006) it used SSM for structuring of the problem of project administration, in an intervention inside of Tesco Store - main retailer of victuals of United Kingdom - to help to develop a specific management model for branch analysis. The idea of that model was to analyze the stores of Tesco specifically in the places where they already had business. To each store, it was considered aspects as market and the demographic place, in order to identify the range of great-products to each store, excluding the products that the company already worked. In that model, the method SSM was adapted to create an aligned specific approach to that problem peculiar of creation of projects of work fronts. The author used the procedure of the method in two stages: first to plan the workshop and later on, during the own workshop to facilitate it.

Horlick-Jones et al. (2001) presented an application that intended redesign the form of the organization of Notting Hill Carnival in England, recognizing the interconnectivity of the areas-problem and the numerous

uncertainty sources that potentially inhibit the decision making in terms that to accomplish actions in a different way. An additional constrain was the fact that the potential participants were people very busy, and could participate in an only workshop. Thus, the authors proposed the use of two methods together in an only workshop, using SSM and SCA. The first method to explore the complexity of the problem and to elicit the possible redesign options, and the second method was used to analyze the uncertainties and interconnectivities. SCA also has the advantage to work in search of commitment packages for future actions.

The Proposed Group Decision Model

This section shows the multicriteria group decision model proposed to support a social sustainable development decision making, incorporating the problem structuring approach as a way to generate ideas and improve the learning process among all members involved.

According to Kaner (1996) *apud* Antunes and Ho (2001), a decision model includes the accomplishment of specific activities set, through four different decision zones in the time: divergent, clarification, convergent and decision zones. Figure 2 presents the general overview of the decision process proposed in this model, based on the model of Kaner, however adapting it to the reality of the problem.

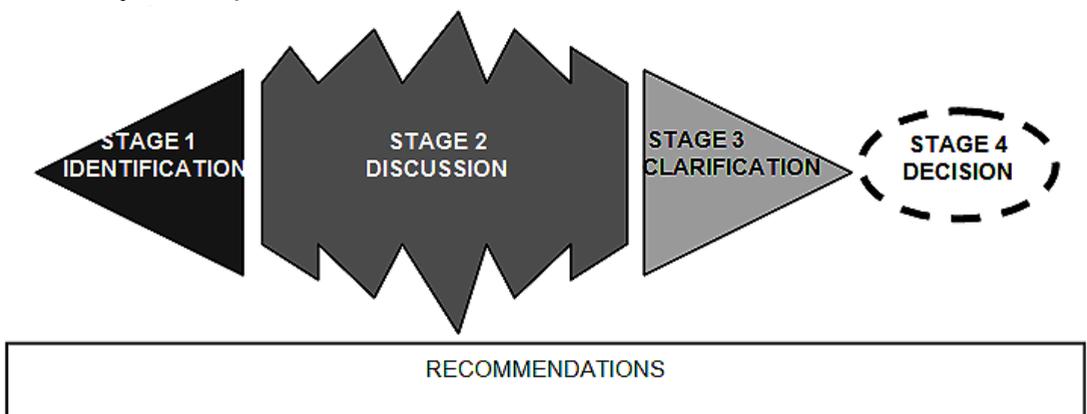


Figure 2 – General overview of the decision process

The model aims to treat the group decision in four stages. In Stage 1 the identification of the problem is accomplished. In Stage 2 the discussions happen, when is incorporated the problem structuring approach for the

specialists' meeting and other actors involved in the process, in order to generate ideas that appear from the comparisons with other perceptions, forming a rich panorama of the situation, helping the decision-makers to know better the problem. In that stage, not only possible solution alternatives are formulated, but also the criteria that should be taking into account are discussed. In the Stage 3 occurs the clarification of the problem, when an individual multicriteria evaluation with all group members is accomplished, in other words, all decision-makers face the same matrix alternatives x criteria, but they can evaluate according to their own values systems, considering their specific interests. Finally, in Stage 4 a final decision is obtained through a new multicriteria analysis, where the decision-makers are the new criteria and the results of the net flows are the evaluations of the alternatives.

Accompanying all stages, there is a process of recommendations, what makes dynamic the evolution of the model in terms of learning about the perceptions of the problem among the decision-makers. During each stage are generated recommendations that can be used in during the next stage and, consequently, for all the remaining process. The decision-makers interests and preferences are evaluated, modeled and explored to generate ideas and to allow revisions of judgments of other decision-makers, until any more new ideas appear on the problem. That interactive process facilitates the fast learning cycle and understanding and even possible changes in the subjective point of view of the decision-makers. The Figure 3 shows an outline detailed by stages.

Following the stages that compose the model are described.

STAGE 1: Identification of the Problem

The stage of problem identification represents the complexity of the situation and incorporates elements judged important for the decision process. Thus, in this stage the decision-makers are identified, as well as the data collection about the problem situation are accomplished.

Decision-makers identification

In many situations, especially in public administration, there are not obvious decision-makers, either decision processes totally clear. The decision-makers appear as a set of organizations that, having a common objective, will make that the activity of decision support develops toward their interests.

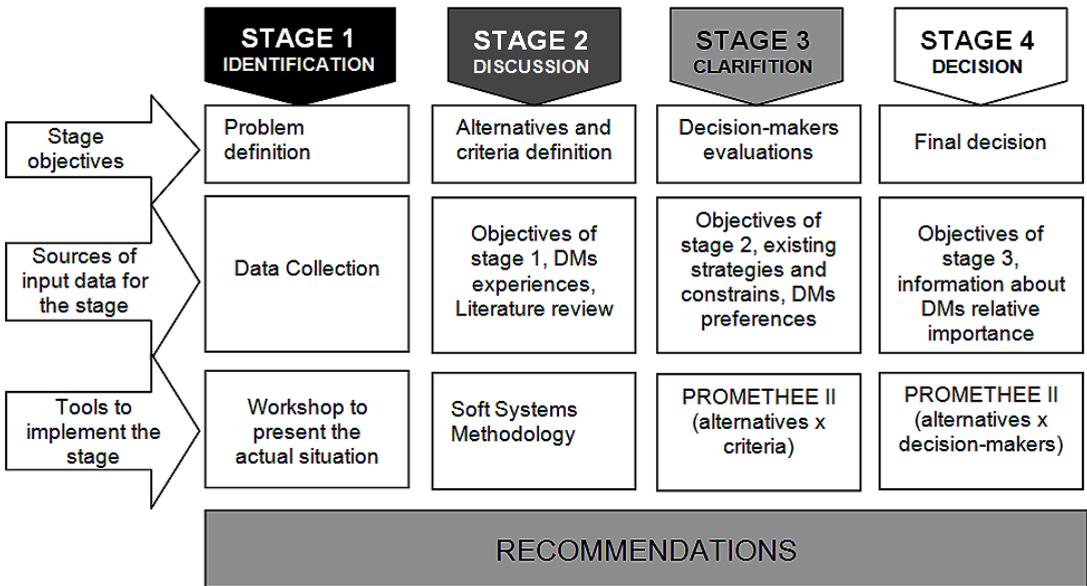


Figure 3 – Outline detailed by stages of the proposed model

There are the ‘pressure’ groups, or stakeholders, in the terminology adopted by Roy (1996), that even have not formal responsibility for the choice, participate actively of the decision process. Beyond of those, there are the ‘third part’ groups, which do not participate actively of the decision process, but are affected for the consequences, and their preferences need to be considered during the decision process.

Another important actor is the analyst that is the responsible for the modeling of the decision process. The role of this actor is to explain, to justify and to recommend, however, in an independent way of his own value system. The analyst should lead the meeting and moderate the direct discussions among the decision-makers, in order to obtain a decision as efficient as possible.

Data collection

This phase is necessary for the understanding of the problem, when identifying the causes and solution limitations. For that, it is necessary an interaction with the actual problem, seeking a characterization through information that should be obtained with the involved members, reports, environmental characteristics, among other forms.

Data consolidation

In this phase all the data are worked and consolidated, in order to elaborate a consistent diagnosis of the current situation of the problem.

According to Checkland (2004), in the SSM approach (Soft System Methodology), information is data interpreted taken into account the context of the application. Thus, the data are descriptive objects that through a transformation process generate information (Figure 4).

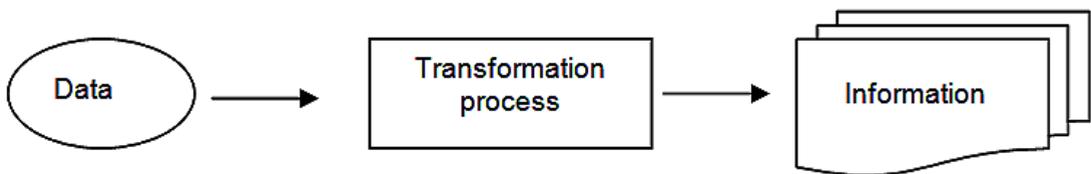


Figure 4 – Data Consolidation

Workshop

After the data consolidation, it should be made a presentation for all the decision-makers to show the current situation of the problem. With the exhibition of those consolidated information, some comment can appear by the decision-makers or some idea can be manifested, which should be logged and kept to be used along the process as recommendations. During this phase, where all group members are gathered and becoming aware in a deeper way about the situation - problem, can be started the Stage 2: Discussion.

STAGE 2: Discussion

This phase is considered the more critical of whole process and the one that will occupy most of time. It has as objective to promote the mutual understanding and to help the group to develop a common context. The analyst should try to create the maximum of possible opportunities enabling each one of the participants expresses their opinions and points of view, in order to identify alternatives and criteria. The matrix evaluation is elaborated (alternatives x criteria).

In this stage, the soft approach of operational research is applied, started from the previous workshop. It is intended to elaborate a problem

structuring in an appropriate way so that all the individuals participant of the process understand the perceptions of the other ones, turning clearer the problem. Thus, that stage seeks to discover the points of view and the perceptions of each decision-maker and which are the satisfactory alternatives of solutions in their opinion; in other words, seeks to discover the knowledge of each decision-maker on the considered subject.

To structure that knowledge expressed by the different decision-makers, turning comprehensible to all and functional for the decision process, a procedure is accomplished based on SSM (Checkland, 2004).

That model articulates an organized process to improve the learning of the problem, what allows liberating the thinking to bring to the context actions that can improve the problematic situation. That stage is important, because it is not effective to propose actions for the real world in a generic way, it should be promoted debates among the specialists, in order to describe a range of interpretations that are important for the process. Thus, the learning through techniques collaborative, expresses the most important perceptions of a private situation and it generates a favorable atmosphere for the formulation of actions appropriated to the analyzed situation. The Figure 5 presents the structure of the learning cycle activities for formulation of the alternatives and definition of the evaluation criteria

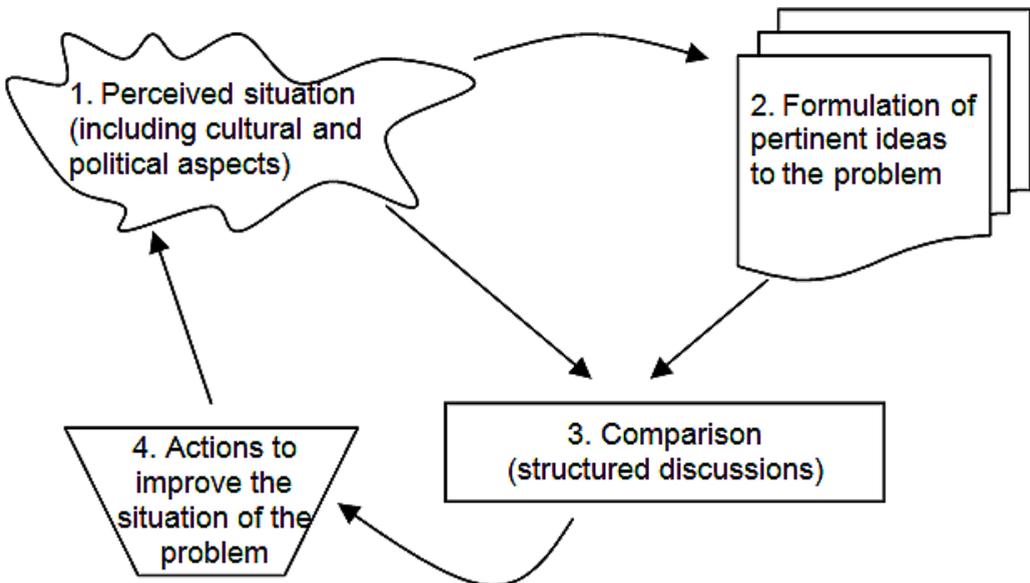


Figure 5 – Basic representation of SSM (Source: Checkland, 2004)



Identification of potential alternatives

The process of identification of the alternatives requests significant creativity and knowledge about the decision situation. Through a brainstorm, the analyst helps the group to explore the possible alternatives. All the decision-makers are invited to formulate possible alternatives and to express their opinions. For each formulated alternative, the group members should argue on it, exploring the advantages and disadvantages of its implantation. Such information can be useful during the negotiation phase among the interested parts giving to all involved a necessary picture of the opposing visions.

That interactive form of identify the alternatives stimulates the creativity and the ideas, promoting a favorable atmosphere for the generation of solutions and the analysis of the consequences of any decision that could be made, exploring the subjectivity of the decision-makers, their restrictions and priorities.

Identification of criteria

During the process, the group members are stimulated to identify the possible criteria to be used. It is in that stage that grows a process of change of perceptions among the actors, what allows an amplification of the spectrum of considered information and a larger understanding of the decision context.

Elaboration of the evaluation matrix

In that stage, it is presented to the decision-makers the matrix with the considered alternatives, in relation to all criteria. For some criteria, it is possible a direct analysis, without contestation by the decision-makers, being obtained through a specific studies for the mensuration, such as cost, being considered the monetary value for the implantation of the alternative. However, for other criteria, that have not a clear scale of values, which can be used as comparison resource, subjective analyses with verbal scales of comparisons are used, which allow to ally the simplicity of the analysis to a larger objectivity warranty. Each decision-maker evaluates the performances individually.

With the evaluation matrix elaborated, the next stage of clarification can be started.

STAGE 3: Clarification

Starting from the discussion stage, where the decision-makers worked in together for the definition of alternatives and criteria, as well as evaluated the performance of those alternatives, the problem is structured for the application of the multicriteria method.

Thus, the PROMETHEE II method should be applied with all decision-makers in order to provide the evaluations about the individual priorities and, for that, it is necessary that each decision-maker evaluates the importance of the criteria and respective parameters.

Individual evaluation of criteria and respective parameters

Once the alternatives and the evaluation criteria have been identified, the evaluation process can start, applying the PROMETHEE II method. Each decision-maker therefore needs to define the criteria weights (w_j), representing the relative importance between criteria, and the information within the criteria which will be given by preference functions ($P_j(a,b)$), that gives for each pair of alternatives a , b , the intensity of preference of a over b for a given criterion. A multicriteria preference index is defined as

$$\pi(a,b) = \sum_{j=1}^n w_j P_j(a,b) \quad (1)$$

Where $\pi(a,b)$ expresses with which degree a is preferred to b over all the criteria, varying from 0 to 1. The following preference flows are then defined:

$$\text{The leaving flow: } F^+(a) = \sum_{b \in A} \frac{\pi(a,b)}{n-1} \quad (2)$$

$$\text{The entering flow: } F^-(a) = \sum_{b \in A} \frac{\pi(b,a)}{n-1} \quad (3)$$

$$\text{The net flow: } F(a) = F^+(a) - F^-(a) \quad (4)$$

According to the PROMETHEE procedure (Macharis et al., 1998),



if any decision-maker considers that some criteria are not relevant to him, he will assess weights equal to zero to these criteria. This means that these criteria will not be considered in his personal analysis. Consequently, although each decision-maker is facing the same evaluation table, the number of active criteria considered by each of them can vary. Besides, a preference function must be associated to each criterion for pairwise comparisons.

Although the set of alternatives and the set of criteria are identical for all decision-makers, the evaluations can be quite different according to the individual weight-distributions. It depends strongly on the actual feelings and specific interests of the decision-makers. Some decision-makers will for instance pay more attention (give higher weight) to technological criteria, others to financial ones, and still others to socio-economical or environmental ones.

For the selection of the preference functions, Brans and Vincke (1985) presented six types of functions that cover most of the cases occurring in practical application for generalized criteria.

Result of the analyses of individual priorities

The result of the application of PROMETHEE II method gives a ranking of the alternatives, which represent the priorities of each decision-maker. The final rankings of each one are collected and disposed in a global evaluation matrix, with the purpose of start the stage 4 of the model.

STAGE 4: Decision

At this stage, everybody has a good personal view of the decision problem and the values of the net flows obtained by PROMETHEE II summarize the points of view of each decision-maker. The higher net flow, the better the corresponding alternative for the decision-maker. With these data, a new decision problem is then considered ($n \times DM$) as displayed in Figure 6.

Macharis et al. (1998) states that it seems not realistic to assess different preference function to these criteria, i.e., to each decision-maker. Their respective individual net flows are computed on the basis of individual preferences and are therefore expressed on the same preference scale. As all criteria values are expressed in the same units, these values can be aggregated directly. Consequently, it seems quite natural to simply compute

the weighted sum of the individual net flows, so that the global net flow for the whole group for a particular alternative will be defined as:

$$\Phi^G(a_i) = \sum_{r=1}^R \phi^r(a_i) \omega_r \quad (5)$$

where

R decision - makers, $r = 1, 2, \dots, R$

$\phi^r(a_i)$ is the net flow corresponding to alternative a_i for decision - maker r

ω_r is the weight of decision - maker, being $\sum_{r=1}^R \omega_r = 1$

This global net flow immediately provides the ranking of the alternatives according to global preference function.

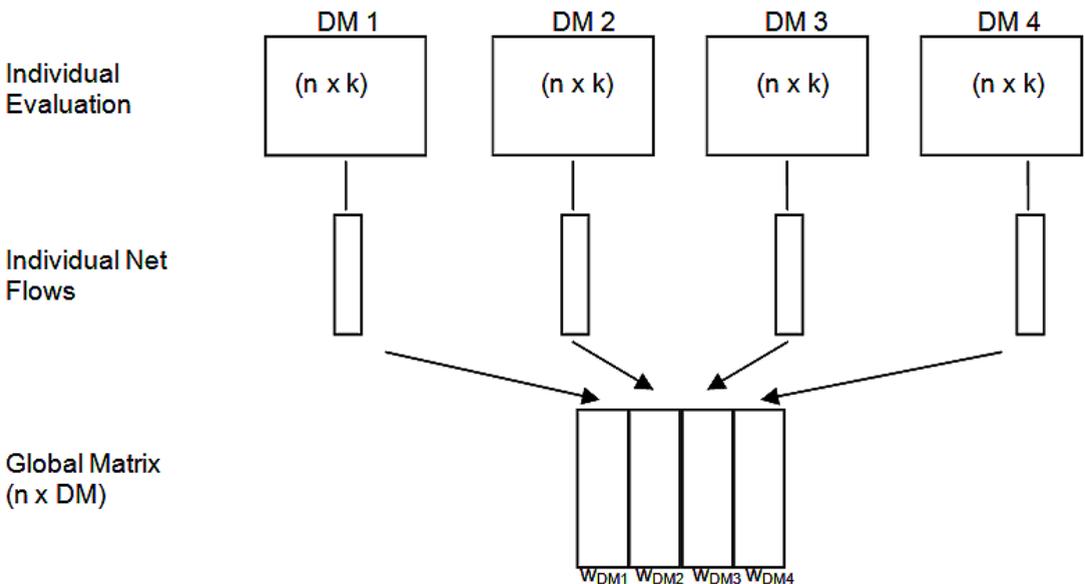


Figure 6 - Overview PROMETHEE GDSS Procedure (Source: Macharis *et al.*, 1998)

The recommendations suggest that there are discussions at every moment, enriching the decision process. That procedure is in accordance to



the adopted by the constructive decision aid (Roy, 1996), where the final result of the decision process is not a decision just imposed by the model, but, a recommendation of a solution to be adopted. Thus, one of the main objectives of the model is to make a better understanding of the problem among all group members and an appropriate strategic planning a social sustainable development.

Conclusions

The paper presented a group decision making model for social sustainable development by the integration of soft (qualitative) and hard (quantitative) approaches of Operational Research. The proposed model is capable to support the decision process during all stages: definition and structuring of the problem, identification of possible solution alternatives, and analysis of the individual priorities reaching the final decision of the grThis model combined two methods of different paradigms with the purpose to generate a fairer and more transparent way of handling social problems, when several actors are involved in the decision process their opinions and perceptions should be taking into account, adapting a participative development.

The soft approach of problems structuring was applied to improve the understanding of the problem, starting from the junction and interaction among several specialists that are interested in the resolution or minimization of some difficulty. In this way, new opinions flow in agreement with the knowledge of each decision-maker, and the discussion about different points of view or perceptions of consequences creates a quite favorable atmosphere of ideas generation. The hard approach was used through the application of an outranking multicriteria method, allowing that each involved participants interprets the situation in a different way, so that they tend to consider their opinions and perspectives in an imperative way, and the decision should be the result of the analysis of the individual priorities.

Besides, the model has a constructive conception, then, accompanying all stages, there is recommendation process, what makes dynamic the evolution of the model in terms of learning about the perceptions of the problem among the decision-makers. In fact, the model presented was built for social sustainable problem, however, it is not restricted to that, instead, it can be used where is necessary to put a group together to think about a specific problem, and after that, to find a solution that incorporate the points of view of

all members involved in the decision process.

Further research will contribute to the practical use of the integrated model, showing case studies and discussing about the use of other combination of soft and also hard OR methods (for instance cognitive maps and Electre, respectively).

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