AN APPLICATION OF THE ELECTRE TRI METHOD TO HUMAN RESOURCE MANAGEMENT IN TELECOMUNICATIONS IN BRAZIL

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Abstract

This paper presents a study developed within an important Brazilian telecommunications company in the context of annual budgeting of personnel costs. With the aim of rationalising the allocation of the available resources, the research developed a decision model which permitted the allocation of differentiated recommendations to the diverse sectors of the company thus satisfying multiple objectives simultaneously. The results produced demonstrate that the focus of Multi-Criteria Decision Analysis can provide consistency and logic to human resources decisions allowing greater demarcation of the characteristics and peculiarities of the company sectors from a wide range of information.

Keywords: Resource allocation, Multi-Criteria Decision Analysis, Budgeting.

1. Introduction

The study presented in this paper was developed and applied inside a Brazilian telecommunications company with 12,000 employees whose head office is in Rio de Janeiro. Its principal purpose was to provide support for the company's human resources area in planning its labour costs on the occasion of the annual corporate budget for the financial year 2003. Basically, it sought to optimise resource allocation using the Multi-Criteria Decision Aiding (MCDA) methodology (Belton and Stewart, 2002; Figueira, Greco and Ehrgott, 2005).

Personnel costs are defined and managed by the Human Resources Management Committee based on the orientation and premises arising from the company's strategic planning. They are composed of the company's operating costs and expenses and are duly reported (in the case of public companies) in the financial statements and annual report. They are composed of employees' salaries, benefits, bonuses and social and labour contributions among others.

The use of MCDA techniques gave consistency and provided a logical structure to the process and was motivated by the need to organise the wide range of human resources information so as to demarcate the characteristics and peculiarities of the company bodies more efficiently. In other words, it was necessary to determine how the resources would be allocated taking into account the wants and needs of each unit.

On the other hand, there was also a need to translate the principal challenges for the company in the context of the decision by means of a hierarchical structure. The human resources area needed an analytical instrument that would facilitate the organisation of values and objectives in order to determine how and where the resources would be allocated.

Furthermore, the work demonstrated how MCDA techniques can be effectively used in the management of the human capital of the organisations.

2. The Choice of the Analytical Model Adopted

According to Larichev and Olson (2001), comparative studies of the diverse MCDA approaches have shown that no one methodology stands out from the others in all decision contexts involving multiple criteria. A decision analyst must have sufficient knowledge to determine which is the best methodology to be applied in terms of the characteristics of the decision to be made.

In order to determine the most suitable MCDA methodology in the context of the decision, a broad investigation of the diverse MCDA methodologies was conducted. This investigation was concentrated essentially on the characteristics of the problem. Using analysis of the sources of data

which would assist the attributes of the decision-making model, the existence of diverse criteria of a qualitative order was established. Based on this, the choice was made to use the Electre methods (*Élimination et Choix Traduisant la Réalité*. Roy, 1985) on the grounds that they are the most suitable for problems with criteria of a strongly heterogeneous nature, where the performances (or evaluations) of the alternatives can be measured in different scales and units. In addition to this fact, the prevailing opinion was that multi-criteria aggregation without a single synthesis criterion rather than presenting a defficiency was in fact an advantage in the decision analysis. The imposition of a complete pre-order frequently leads to a modelling of preferences which is far from realistic. In allowing four different forms of comparison between the alternatives, the methods based on techniques of outranking, without doubt, offer an important contribution to the decision agent.

Thus, the study adopted the ELECTRE TRI methodology (Yu, 1992), of the French school of MCDA, which is based on the idea of outranking (*surclassement*). This methodology is applied to the problem P.β which aims to clarify the decision by a choice resulting from the allocation of each alternative (or action) to a category (or class). The different categories are defined *a priori* based on rules applicable to the group of alternatives by means of comparison of each potential alternative with a stable reference (standard or reference alternative).

The allocation of an alternative a_k to a category is the result of evaluation of a_k based on the criteria and rules which define the category. This allocation does not influence the categories to which the other alternatives will be allocated. The ELECTRE TRI method allocates the actions to the categories in two distinct stages: (1) the construction of an outranking relation *S* which establishes how the alternatives fit within the limits of each category; (2) exploration of the outranking relation *S* in order to allocate the alternatives to their respective categories. Five categories were considered in the study, differentiated according to the investment strategies for the units which would compose them.

3. Case Study

3.1. Analysis of the Consequences and Preparation of the Criteria

Independently of the way in which we prepare the solution of the problem or the recommendation for a course of action in the face of a well-defined situation, it is important to carry out an analysis, evaluation and weighting of the consequences associated with the possible alternatives to be chosen. These consequences are, generally, multiple and include the most diverse units or value measures. As the consequences of the actions are considered and evaluated, the agents involved in the decision can compare the alternatives based on the preference model.

Starting from this understanding, the professionals involved in the work prepared a schematic model with the purpose of evaluating and comparing the characteristics and necessities of each unit of the company from its performances in the criteria which assist the study. The construction of this model served, in the next stage, to model the global preferences composed of the relative importance of these criteria as well as their dimensions. It is important to highlight that the ELECTRE TRI method is applied based on formalised preferences from the construction of a coherent family of criteria.

Faced with this perspective, some questions were put in order to guide the identification of the consequences: (1) which consequences are more likely to interfere in the objectives or value systems considered in the decision making process? (2) among the consequences considered, which should be formalised and how? (3) to what extent could factors such as imprecision and uncertainty possibly interfere in the evaluation of these consequences? The consideration of these questions served to guide this stage of the work and, thus, form a basis for the formation of the family of criteria adopted in this study.

The first list of elementary consequences was therefore drawn up based on these considerations — represented by the characteristics or attributes of the units of the organisation — which would constitute the range of consequences of the study. A definition was associated with each consequence so as to allow all those involved in the decision making process to understand them clearly and unequivocally. After coherence tests, this exhaustively judged list was finally made up of 13 elementary

consequences which determined the way in which each unit in the organisation would be evaluated, as shown in Table 1.

Table 1: Elementary Consequences

No.	Dimension
1	Strategic position of the units
2	Performance evaluation of the units
3	Performance evaluation of the employees
4	Hierarchical structure of the areas
5	Functional categories of the employees
6	Rate of salary readjustment in the face of the salary composition of the units
7	Salary readjustments by average headcount of the units
8	Academic background
9	Qualification of the posts
10	Discriminant analysis of the employees in the face of voluntary turnover
11	Indices of voluntary turnover
12	External salary equivalent salaries
13	Internal equivalent salaries

Therefore, this list of elementary consequences represented the way in which the bodies of the company were analysed and evaluated, in the sense of laying down a clear and structured judgement of its main necessities and characteristics. So that the consequences could be seen as dimensions, a preference scale (or performance vector) was associated to each of them, in order to determine the

precise judgement of its performance. Thus, the consequences drawn up came to represent the dimensions of the problem (i=13), paving the way for the beginning of the process of constituting the criteria of the decision-making model.

According to Roy and Bouyssou (1993), a criterion aims to summarise, through a function, the evaluations of an action (or alternative) on diverse dimensions which can be associated with the same axis of significance. A criterion can be understood as being a “point of view” or “axis of significance” composed of one or more dimensions. The set of criteria of the decision-making model enables the agents involved in the construction of the decision-making model to formalise their preferences in a global way. This set comes to represent a family, named F, which must possess a minimum coherence defined from the operational axioms.

Thus, the thirteen dimensions identified served as a base for the formation of a family of criteria. It is important to observe that, strictly speaking, each dimension can make up a criterion. Notwithstanding, the analysis gave priority to the formation of criteria which would represent primary concerns in the context of the study.

Some principles were followed in the definition of the criteria: (1) the axis of significance on which each criterion aggregates the performances of the dimensions must be easily understood by all of the people involved in the decision-making process; (2) the number of criteria must be as small as possible in order to avoid disputes and to facilitate their understanding; (3) the family of criteria must be accepted as a base for checking the performances of the units of the company so as to allow comparisons and justify the global preferences assumed in the study.

Various groupings of dimensions were tested according to these principles. Finally, after the application of coherence tests, a family of 7 criteria was established. Thus, we arrive at Table 2 formalising the range of consequences (also known as the cluster of consequences $\upsilon(a)$) — represented by the family of criteria F: g_1, g_2, ..., g_7.

Table 2: Criteria

Criteria
g_1 - Strategic Positioning
g_2 - Performance Evaluation
g_3 - Unit Structure
g_4 - History of Salary Progressions
g_5 - Professional Qualifications
g_6 - Voluntary Turnover
g_7 - Equivalent salaries

3.2. Fundamental Axioms of Coherence and Operational Tests

For the family of criteria F to perform its function of aiding a decision-making process in a suitable way establishing preferences on a set of potential actions, three basic coherence axioms need to be respected. They are the axioms of exhaustivity, cohesion and non-redundancy (Roy and Bouyssou, 1993).

After the identification of the dimensions, the analysts go on to apply the coherence tests in order to ensure that the criteria of F are associated to a restricted model of preferences. Its set must permit the modelling of the problem's preferences in a global context. Thus, it was sought to guarantee that the family F ensured a minimum coherence between these two levels. The results arising from the operational coherence tests are shown in synthesis in this section.

- Fundamental axiom of exhaustivity: The criterion g_7 (Equivalent Salaries), originally considered only comparisons with other companies participating in the salary research carried out by the company. It was observed that in addition to this external consistency, it was necessary to make an internal comparison with the units of the company itself. In this way, another dimension was adopted: “Internal equivalent salaries” to reliably reflect the preference model connected to its

axis of significance.

- Fundamental axiom of cohesion: All the criteria considered in the preference model passed the test.
- Fundamental axiom of non-redundancy: In the formation of the criterion g_3 (Structure of the Units), at first a dimension was considered which, later, did not prove valid in the non-redundancy test. The test permitted the other dimensions of the criterion to be tested which showed that there was no need for its existence given that they guaranteed the integral understanding of the consequences of the preferences model structured.
- Therefore, after the coherence tests, the coherent family of criteria (C.F.C.) adopted in the study was represented by F= $\{g_1, g_2, g_3, g_4, g_5, g_6, g_7\}$ defined in A.

Table 3: Coherent Family of Criteria

Criteria	Dimensions
g_1 - Strategic Positioning	Strategic positioning of the units
g_2 - Performance Evaluation	Performance evaluation of the units; Performance evaluation of the employees
g_3 - Unit Structure	Hierarchical structure of the areas; Functional categories of the employees
g_4 - History of Salary Progression	Rate of readjustment in the face of the salary composition of the units; Number of readjustments by average headcount of the units
g_5 - Professional Qualifications	Academic background; Qualification of the posts
g_6 - Voluntary	Discriminant analysis of the profiles

Turnover	of the employees in the face of voluntary turnover; Indices of voluntary turnover
g_7 - Equivalent salaries	Internal equivalent salaries; External equivalent salaries

3.3. Performance matrix and Definition of the Pseudo-criteria

After the definition of the family of criteria, data was collected in order to construct the Performance Matrix relating the performance of each unit in the company to the criteria in the study. This evaluation is carried out with reference to the scales of preference related to the 13 dimensions on which the criteria were based. It is important to point out that these evaluations were, in certain dimensions, scored by points (dimensions 1, 6, 7, 11 and 13). For the others, the technique of scoring by weighted average was adopted. This being so, it was possible to arrive at the matrix which relates the performance of the 13 units of the company to the 7 criteria adopted in the study as shown in Table 4.

Table 4: Performance Matrix

Criteria / Units	g_1: Strategic Positioning	g_2: Performance Evaluation	g_3: Unit Structure	g_4: History of Salary Progression	g_5: Professional Qualification	g_6: Voluntary Turnover	g_7: Equivalent salaries
a_1	1.0	4.0	4.6	6.0	4.3	2.7	5.5
a_2	1.0	5.0	4.9	2.0	5.0	1.3	8.2
a_3	3.0	4.5	5.7	3.0	4.4	9.7	6.0
a_4	1.0	3.5	3.4	7.0	4.1	4.7	6.5
a_5	1.0	2.0	5.1	7.0	4.9	3.7	8.2

a_6	3.0	6.5	4.3	5.0	5.2	12.0	8.0
a_7	3.0	5.5	5.7	5.0	5.7	12.2	8.9
a_8	3.0	7.0	5.4	1.0	5.4	1.9	5.9
a_9	3.0	4.0	6.2	6.0	5.2	11.6	4.9
a_{10}	2.0	3.0	4.3	9.0	3.5	2.8	8.2
a_{11}	3.0	5.5	6.4	9.0	6.0	3.5	4.6
a_{12}	2.0	5.0	5.0	3.0	5.1	3.6	6.2
a_{13}	3.0	7.0	6.3	3.0	5.7	2.1	4.8

The performance matrix was first completed in order to determine the values of pseudo-criteria made up by the weak and strong preference thresholds — (q_j) and (p_j), respectively. In this way, it is possible to identify and analyse more realistically the deviations found in the performance of the units under different criteria. In other words, considering the values found and taking into account factors such as imprecision, uncertainty and hesitation, a discussion was initiated on the differences $g_j(a_k)$ - $g_j(a_i)$, which could provide a base for the weak and strong preference thresholds. Using this procedure as a base the threshold values for q_j and p_j were finally reached, as shown in Table 5.

Table 5: Values for q_j and p_j

	g_1	g_2	g_3	g_4	g_5	g_6	g_7
q_j	1	1	0.5	1	0.6	1	1
p_j	1	2.5	1.3	2	1.3	2.5	1.5

3.4. Modelling and Exploration by ELECTRE TRI

The application of the ELECTRE TRI methodology was carried out in four distinct stages:

1. allocation of values to the weights kj;
2. allocation of values to the veto thresholds vj;
3. exploration of the relation S of ELECTRE TRI;
4. sensitivity and robustness analyses

3.4.1. Allocation of values to k_j

The procedure adopted concerning the determination of the weights of the criteria (k_j) did not consist of the direct allocation of weights. The absolute definition of k_j was avoided, regardless of the fact that the family of criteria consists of a system of preferences which, in spite of the role which each criterion exercises, does not presuppose that their value judgements be imposed in an isolated manner. In this way, the importance given to each criterion was not realised without a direct comparison with the others that make up F. Using a constructivist approach, the various hypotheses were formalised in the attempt to represent in as faithful a way as possible the system of values of the people involved in the work. Thus, the construction of the values of k_j was carried out from the adjustments, until the relative importance of the criteria was determined.

The technique employed relied on a system of inequalities. This way of proceeding sought to reflect the qualitative order opinions on the importance attributed to each criterion. In this way, a consensus was created from the following inequalities:

- $k_1 > k_2 > k_4 = k_7 > k_6 = k_3 > k_5$,
- $k_1 = k_2 + k_4$,
- $k_2 = k_4 + 1$,

- $k_4 = k_6 + 2k_5$,
- $k_6 = 3k_5$

Presuming in a non-restrictive way that $k_5=1$, one finally reaches the values shown in Table 6.

Table 6: Values for k_j

	g_1	g_2	g_3	g_4	g_5	g_6	g_7
k_j	11	6	3	5	1	3	5

3.4.2. Allocation of Values to the Veto Thresholds v_j

The analyses conducted in the study to determine the veto thresholds (v_j) took into account the values attributed to k_j. In other words, it was decided that the veto values should be defined bearing in mind the relative importance of the criteria. The principal question which arose consisted of judging if for g_j the possibility of imposing the power of veto were convenient, considering the hypothesis of outranking in all of the other criteria. In this way, it was judged pertinent to see v_j as dependent on g_j.

An important parameter for the allocation of the values of v_j, for each criterion considered, consisted of the relation defined by v_j / p_j (with $p_j \neq 0$). With this, it could be determined that the criteria represented by g_5 and g_3 should not impose the possibility of veto due to the characteristics peculiar to these criteria. In this way, extreme values were allocated to v_5 and v_3, so as not to allow the hypothesis of a veto. The values determined for v_j are shown in Table 7.

Table 7: Values for v_j

	g_1	g_2	g_3	g_4	g_5	g_6	g_7
v_j	2	5	4	6	3	7	4

3.5. Exploration of the Relation *S* of ELECTRE TRI

The ELECTRE TRI methodology is designed for the problem P.β, the purpose of which is to clarify the decision by a resulting choice of the allocation of each action *a* (represented by a unit of the company) to a category. This procedure of allocation (or classification) is performed by comparisons between the actions of A and a reference action, which we call b_h. These reference actions are defined to base the allocation of the actions of A to the categories established in the model. Each reference action performs the role of a fictitious body in the context of the study, formalising the characteristics which a unit should have to base its allocation in a category. The performances of these profiles mark the boundary between two categories. In other words, a specific profile determines the boundary between two categories.

Five distinct categories to which the units should be allocated were adopted for this study. In this way, only four reference actions were necessary for the limits of the categories to be established. The action b_1, for example, determines the limit between categories E and D, while b_2 determines the limit between categories D and C, and so on in succession. Therefore, each reference action b_h bounds the lower part of the category C_{h+1} (called low profile), and the upper part C_h (called high profile).

In order to reach the allocation procedure, the professionals who participated in the work went on to investigate the profile which could be considered standard for each reference action. The definition of this profile was established from its performance in n criteria of F:

$\underline{g}(b_h) = (g_1(b_h), ..., g_n(b_h))$

After the construction of various hypotheses, a model was finally arrived at which was judged suitable for the determination of the profiles of b_h, as shown in Table 8. It is worth mentioning that an important concern in the development of the reference profiles of the categories was given to the spacings between the performances of the actions. In other words, in the hypothesis of two reference actions having relatively similar performances, the possibility of double allocation could occur. To

eliminate that possibility, it is necessary to define the profiles of b_h with consistently different performances in the sense of cancelling the possibility of the allocation of a determined action in two distinct categories.

Table 8: Table of the Reference Profiles b_h

	g_1	g_2	g_3	g_4	g_5	g_6	g_7
b_1	1	3	4	3	4	2	5
b_2	1	4	5	4	5	3	6
b_3	2	5	6	6	5	5	8
b_4	3	7	6	8	6	7	9

After the definition of the reference profiles, the next stage was the definition of the binary relations defined by aHb_h. The steps and the formulas used in this stage were:

(1) calculation of an index of partial concordance;

(2) calculation of an index of global concordance;

(3) calculation of an index of discordance;

(4) calculation of an index of credibility;

(5) definition of the relations of preference from the determination of the cut-off level (λ).

After operational tests, it was determined that the cut-off level λ initially adopted should be 0.8. Based on this, the binary relations presented in Table 9 were finally determined, identifying the outranking relations (S) or indifference (I).

Table 9: Binary Relations to Hb_h

a_kSb_1	a_kSb_2

a_1Ib_1	a_8Sb_1	a_1Ib_2	a_8Sb_2
a_2Sb_1	a_9Sb_1	a_2Ib_2	a_9Sb_2
a_3Sb_1	$a_{10}Sb_1$	a_3Sb_2	$a_{10}Sb_2$
a_4Sb_1	$a_{11}Sb_1$	a_4Ib_2	$a_{11}Sb_2$
a_5Sb_1	$a_{12}Sb_1$	a_5Ib_2	$a_{12}Ib_2$
a_6Sb_1	$a_{13}Sb_1$	a_6Sb_2	$a_{13}Sb_2$
a_7Sb_1		a_7Sb_2	
a_kSb_3		a_kSb_4	
b_3Sa_1	a_8Rb_3	b_4Sa_1	b_4Sa_8
b_3Sa_2	a_9Sb_3	b_4Sa_2	b_4Sa_9
a_3Sb_3	$a_{10}Ib_3$	b_4Sa_3	b_4Sa_{10}
b_3Sa_4	$a_{11}Sb_3$	b_4Sa_4	b_4Sa_{11}
b_3Sa_5	$a_{12}Ib_3$	b_4Sa_5	b_4Sa_{12}
a_6Sb_3	$a_{13}Rb_3$	a_6Ib_4	b_4Sa_{13}
a_7Sb_3		a_7Ib_4	

Finally, the last stage of exploration of the ELECTRE TRI method was reached which consists in allocating the actions of the problem to the previously defined categories. This process, known as the allocation procedure, aims essentially to analyse the way in which each action compares with the reference profiles which bound the categories C_j. This comparison permits the category in which each action must be allocated to be determined.

The allocation procedure was begun with the Pessimistic ELECTRE TRI (conjunctive procedure). In this procedure, the comparison begins with the best reference action and proceeds to the action immediately below until the first reference action b_h which is outranked by *a*. The action *a* is then

allocated to the category which is limited in the lower part by this reference action $b_{h.}$ Immediately afterwards, the Optimistic ELECTRE TRI (disjunctive procedure) is carried out. In this procedure, the comparison of *a* is begun with the worst reference action, passing to the action immediately above, until the first reference action b_h which is superior to *a* is identified. The action *a* is then allocated to the category which is bound on the upper part by the reference action b_h.

A first conclusion on the two allocation procedures adopted is that they meet the requirement of uniqueness. This requirement determines that each action must be allocated to one, and only one, category C_k constructed in the model. Thus, the double allocation of actions does not occur.

To determine the final recommendation of the work, the two procedures adopted were extensively discussed. However, the pessimistic allocation may finally prevail due to the motives described below.

The professionals involved in the work judged the Pessimistic ELECTRE TRI method to be more consistent for the predominantly restrictive scenario of resources designed for personnel costs. With this, the idea prevailed that in doubt between the categories, the actions analysed should be allocated to the lowest possible categories. A consensus was obtained concerning the philosophy of allocation to be adopted. In this sense, the idea prevailed that to be allocated in a category, a specific unit should, unfailingly, possess sufficiently strong characteristics to be superior to the action which bounds the lower part of the category. In this way, the most rigorous procedure of allocation prevailed, where the allocation to a category is only justified if a unit possesses sufficient conditions for this.

3.6. Sensitivity and Robustness Analyses

After the allocation of the units to their respective categories, attention was turned to carrying out the sensitivity and robustness analyses. The objective of this phase was to check in which way the variations introduced in the parameters specified in the model influenced the results obtained. With this, the results of the optimistic and pessimistic allocations were considered provisional.

Bearing in mind the hesitation which arose during the construction of the pseudo-criteria and the values which defined the relation S — k_j, v_j and λ — the sensitivity and robustness analyses were shown to be indispensable in arriving at a recommendation which could be considered robust. The main question which was put at this stage of the work was to determine if the conclusion on the allocation of the units could be considered definitive, from the examination of the stability provided by these analyses, or, if there should be a revision of this conclusion from the new values introduced in the parameters.

The sensitivity and robustness analyses were structured in two distinct stages: (1) the introduction of two different families of thresholds, the first q_j and p_j, and the second k_j and v_j, in the 7 criteria adopted in the study; (2) for the provisional results and for the two sets of different thresholds, λ values of 0.9 and 0.7 were adopted. It is important to point out that values were adopted which could be considered extreme, in other words, the intervals between these values were substantially increased, so as to demonstrate the stability of the results. The critical exams carried out after the introduction of the new families demonstrated the following points:

- the results arising from the initial parameters practically did not undergo any alterations due to the changes introduced in the thresholds;
- the changes generated by the introduction of λ (0.9 and 0.7) produced appreciable alterations in the allocation of the units (it was judged not necessary to examine the results through optimistic allocation due to the arguments previously stated). Nevertheless, the effects of these alterations were not considered satisfactory because of the excessive concentration of units in the intermediate categories.

Therefore, the carrying out of the sensitivity and robustness analyses were able to prove the stability of the results initially found. In this way, it was possible to reach the conclusion that the partial results defined from the initial family of parameters justified the initial conclusion of the study. Table 10 presents the final classification of the actions.

Table 10: Final Classification of the Actions in the Categories

Categories	Actions
A	—
B	a_3, a_6, a_7, a_9, a_{11}
C	a_8, a_{10}, a_{13}
D	a_2, a_4, a_5, a_{12}
E	a_1

4. Conclusions and Recommendations

After the development of the study and its effective application, various benefits could be identified by the professionals who had, in some way, participated in the study. Next, we shall cover the principal conclusions which demonstrated the gains brought by the study.

Initially, the work came to satisfy the need to structure the information in the HR area in a logical and organised way. Paradoxically, in spite of the wide range of information on the personnel in the company, only a limited amount was used effectively in the decision-making processes of people management. Its decisions were far too simple and narrow. The study came to offer a means of structuring the information in the sense of providing knowledge in respect of the profile, characteristics and needs of each body in the company. Although the work had been concentrated on the planning on personnel costs, this knowledge can and will be used in other processes of the HR Management Committee.

Another important contribution identified was the ease of creating and analysing alternatives. The work contributed to making the professionals involved in the study more creative in the search for alternatives or solutions to the problem. In fact, as the project progressed, new dimensions and criteria were suggested, reflecting the constructivist nature of the decision model. In addition, the robustness analysis permitted the refinement of the category profiles considered thus creating the feeling that all of

the possibilities of understanding the problem had been exhausted.

Finally, the communication process was substantially improved. The modelling of the objectives and the preferences promoted and facilitated communication and interaction between those involved or affected by the planning. This study developed an extremely well structured environment of mutual collaboration, guaranteeing that the logic adopted was understood by all. In other words, we can say that a common language was created for the decision-making process. By means of a methodology which formalised and structured multiple objectives, the study also served to facilitate not only understanding but also the defence of points of view adopted, seeking to legitimise the decision made. All of this contributed to generating a climate of commitment and acceptance by the bodies. The decisions were very well grounded, which reinforced the credibility of the process.

In order to share the lessons learnt during the development of this study it is important to prepare some recommendations for future work.

Initially, it is fundamental that the approach is based on the involvement and participation of all of the important players in the development of the decision. This strategy of action seeks, before all else, to promote a feeling of “paternity” among those who are, ultimately, responsible for the execution and consequences of the decision. It can be said that the professionals from the HR area and other areas felt much more confident in applying the methodology developed from active participation in the construction of the model. In other words, it is fundamental that they feel that they are the masters of the decision, so that the work is truly the fruit of their convictions, experiences, feelings and values.

Lastly, it is of the greatest importance that a careful investigation of the decision context is made before beginning to construct the modelling of the decision based on MCDA techniques. As stated previously, the comparative studies between the various methods and techniques of MCDA demonstrate that no one methodology stands out from the others in all decision contexts involving multiple criteria. Therefore, it is fundamental to undertake a detailed investigation of the principal characteristics of the decision so as to certify that the model chosen is effectively suitable for the problem.

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